

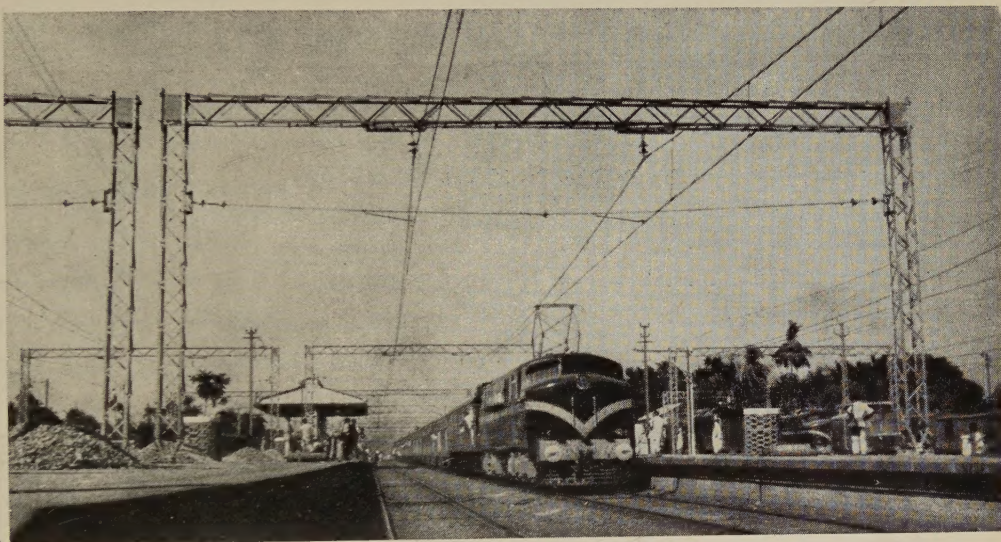
# Monthly Bulletin of the International Railway Congress Association (English Edition)







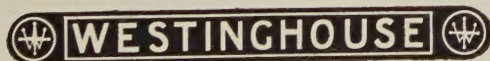
# The first 3,000-v. electrics to go into service in India



Built by The English Electric Company for the 3,000 v. D.C. electrification, twelve of these electric locomotives are now operating on the Howrah to Burdwan Section of the Eastern Railway of India.

These 111-ton 3,120 h.p. locomotives designed for a service speed of 70 m.p.h. were the first 3,000-volt electrics to be commissioned into service in India.

**Fitted with**



**AIR / VACUUM BRAKING**

WESTINGHOUSE BRAKE AND SIGNAL CO. LTD., 82 YORK WAY, KING'S CROSS, LONDON, N.I, ENGLAND



## Alphabetical Index of Advertisers

### Firms :

Belgian Railways . . . . .  
 Cockerill-Ougrée (S. A.) . . . . .  
 English Electric Company Ltd. (The) . .  
 Ericssons (LM) Signalaktiebolag. . . . .  
 General Electric Co. Ltd. (The) . . . . .  
 Hasler (A. G.) . . . . .  
 Matisa Equipment Limited . . . . .  
 Metropolitan-Cammell Carriage & Wagon  
 Co Ltd. . . . .  
 Metropolitan-Vickers-GRS Ltd. . . . .  
 Pressed Steel Co Ltd. . . . .  
 R.I.V. (Officine di Villar Perosa). . . .  
 Roberts (J.W.) Ltd. . . . .  
 S.A.B. (Svenska Aktiebolaget Bromsre-  
 gulator) . . . . .  
 SACM (Soc. Alsacienne de Constructions  
 Mécaniques) . . . . .  
 Siemens and General Electric Railway  
 Signal Co. Ltd. . . . .  
 S.K.F. (Société Belge des Roulements à  
 Billes) . . . . .  
 Soc. Lorraine des Anc. Etabl. de Dietrich  
 & Cie de Lunéville . . . . .  
 United Steel C<sup>ies</sup> Ltd. (The) . . . . .  
 Voith (J.M.) G.m.b.H. . . . .  
 Westinghouse Brake & Signal Co., Ltd.

### Specialities :

III	Trans-Europ-Express.
—	Steam and Diesel locomotives.
VII	Railway electrification.
—	Railway signalling.
V	Electric traction equipment.
VIII	Speed indicators and recorders.
—	Permanent way equipment.
X	Lightweight railway coaches. Diesel locomotives.
IX	Signalling equipment for railways.
XI	Wagons.
VI	Axleboxes.
—	Insulation for railway rolling stock.
—	Automatic slack adjusters.
III	Diesel engines.
IV	Signalling equipment.
—	Axleboxes.
VIII	Railway rolling stock.
XII	Railway materials.
—	Hydraulic transmissions.
I	Railway signalling. Brakes.



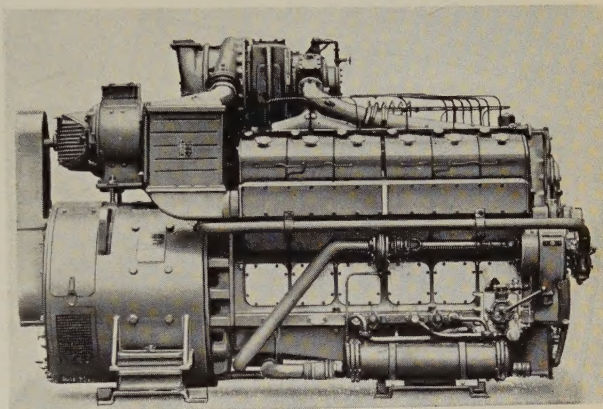
# SACM

SOCIETE ALSACIENNE  
DE CONSTRUCTIONS MECANQUES  
MULHOUSE (France)

MGO DIESEL ENGINES from 300 to 1400 h.p.

For :

Main Line Locomotives  
Shunting Locomotives  
High Speed Trains  
Generating Sets  
Stationary Applications  
Oil-drilling Plants  
Pipe-Line pumping sets



PARIS Office : 32, rue de Lisbonne (8<sup>e</sup>)

Traction set with MGO V 12 A SHR Engine 925 B.H.P. at 1,500 r.p.m., as used by the 25 ALSTHOM locomotives supplied to Argentine Railways.



## HIGH SPEED TRAVEL BY TRAIN

REACH YOUR BUSINESS  
APPOINTMENTS IN TIME

From Brussels to

By Trans-Europ-Express

By ordinary train

1 h. 48 m.	Aachen	1 h. 56 m.
1 h. 35 m.	Rotterdam	1 h. 57 m.
—	Lille	2 h.
1 h. 54 m.	The Hague	2 h. 15 m.
2 h. 35 m.	Luxembourg	2 h. 40 m.
2 h. 31 m.	Köln	2 h. 47 m.
2 h. 35 m.	Amsterdam	3 h. 10 m.
2 h. 48 m.	Paris	3 h. 37 m.
—	Düsseldorf	3 h. 58 m.
—	Essen	4 h. 10 m.
2 h. 58 m.	Bonn	4 h. 26 m.
—	Dortmund	4 h. 57 m.
4 h. 49 m.	Strasbourg	5 h. 56 m.
4 h. 40 m.	Mainz	5 h. 58 m.
5 h. 09 m.	Frankfurt (Main)	7 h. 22 m.
6 h. 13 m.	Bâle	7 h. 40 m.
—	Cherbourg	9 h. 13 m.

COMFORT - PUNCTUALITY



**pointers  
to  
efficiency . . .**

*In the modernisation  
of the world's  
railway systems  
efficient signalling  
facilities are vital.*

*Such facilities can be  
planned, provided  
and installed by*



**THE SIEMENS AND GENERAL ELECTRIC  
RAILWAY SIGNAL COMPANY LIMITED  
EAST LANE, WEMBLEY, MIDDLESEX**



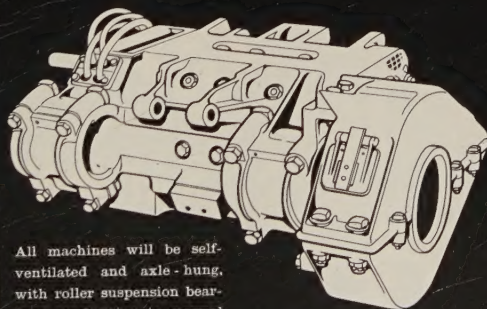
## 1,200 G.E.C. traction motors ordered by London Transport



The motors are for tube and surface rolling stock to implement London Transport's replacement programme announced last year. All these machines will be built at the new traction motor works of the G.E.C. at Dudley Port, Staffs.

*The Piccadilly Line* will have 760 G.E.C. traction motors with a continuous rating of 80.5 h.p. at 66% field. They will be generally similar to the 32 machines already supplied by G.E.C. for the three prototype tube trains now running on the Piccadilly Line.

*The Metropolitan Line* of London Transport will have at least 446 G.E.C. traction motors with a continuous rating of 69.5 h.p. at full field. With the completion of these orders G.E.C. will have supplied over 4,500 railway traction motors to London Transport since 1925.



All machines will be self-ventilated and axle-hung, with roller suspension bearings, conforming to normal London Transport practice.

# G.E.C.

## traction motors

THE GENERAL ELECTRIC CO. LTD. OF ENGLAND  
Magnet House, Kingsway, London, W.C.2.

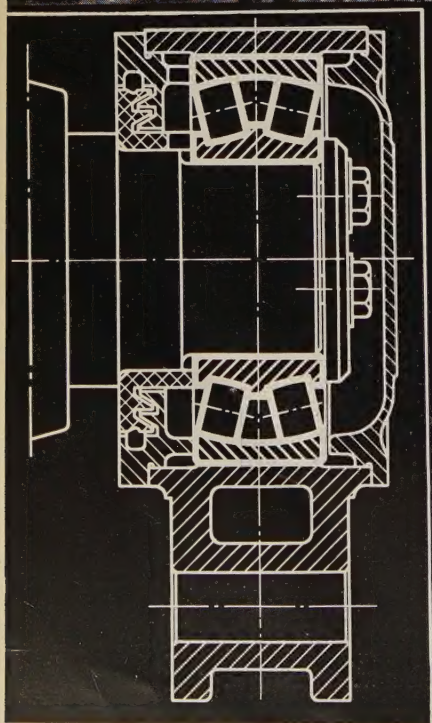




TR 216

FIAT 077B RAILCAR IN OPERATION ON GREEK RAILWAY

**RAILWAY JOURNAL AXLE-BOXES**



**RIV**

OFFICINE DI VILLAR PEROSA S. p. A. - TORINO



MODERNISATION IN PRACTICE



*The*  
**'ENGLISH ELECTRIC'**  
*3,300 h.p.*  
**DELTIC**

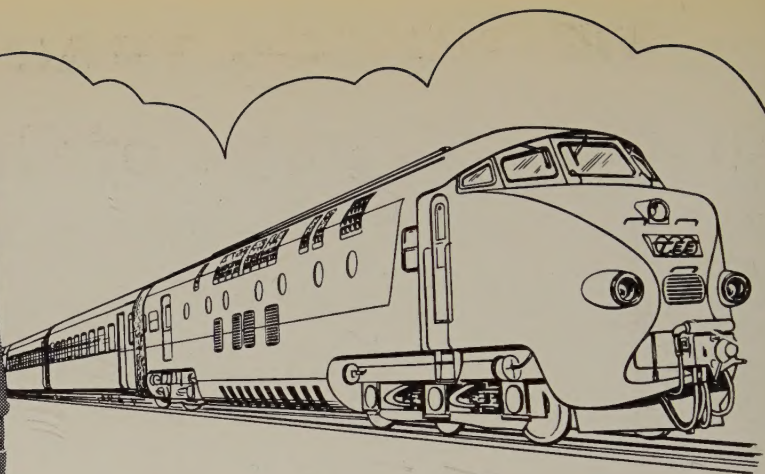
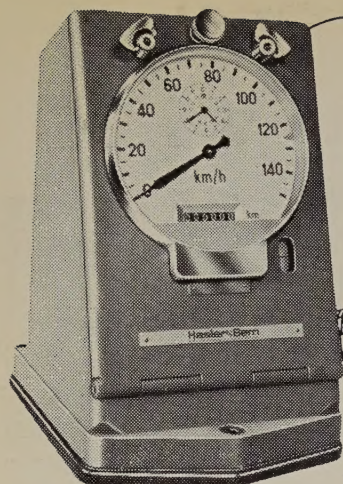
*Ordered in quantity*

*Twenty-two of these 3,300 h.p. locomotives, each powered by  
two 1,650 h.p. Napier Deltic diesel engines,  
have been ordered for use on British Railways.*

*in association with* · VULCAN FOUNDRY · ROBERT STEPHENSON & HAWTHORNS

*Offices and representatives throughout the world.*

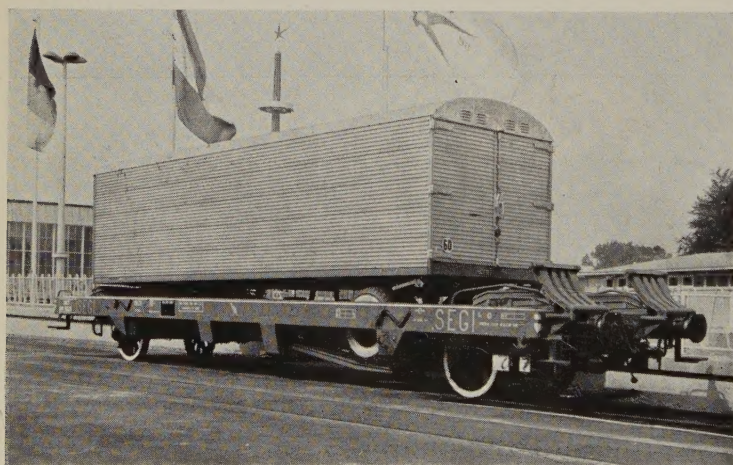




## TELOC Speed Indicators and Recorders

**Hasler<sup>SA</sup> Berne**

are appreciated throughout the world as they provide valuable information to the traffic Manager for the reorganisation and speeding up of railway services. TELOC instruments have, in fact, recently been installed on the Trans Europe Express Trains operating between Switzerland and Holland.



“KANGAROO” special wagon for the transport of standard road semi-trailers.



### PRODUCTION :

Railway rolling stock, carriages and wagons.

Special wagons of all types.

Road trailers and semi-trailers.

Movable metallic houses and class rooms.

# SOCIÉTÉ LORRAINE

DES ANCIENS ETABLISSEMENTS DE DIETRICH ET CIE DE LUNÉVILLE  
LIMITED COMPANY — CAPITAL : 631.560.000 FR.

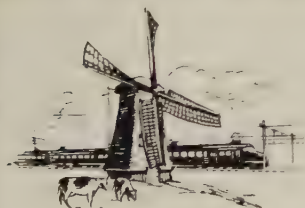
HEADQUARTERS: 3, Av. du Président Wilson - PARIS-16<sup>e</sup> - Tel. PAS. 35-29

Works at LUNÉVILLE and BAGNÈRES-de-BIGORRE



# METROVICK TRACTION

## for the railways of the world



## Netherlands Railways

have been using Metrovick equipment continuously since 1925.  
Recent orders include: **164** 250 h.p. traction motors. **496** sets of  
resilient gears • **258** inductive shunts

**METROPOLITAN-VICKERS**

ELECTRICAL CO. LTD. • TRAFFORD PARK • MANCHESTER, 17

*An A.E.I. Company*

*Modern railway systems throughout the world are equipped by Metropolitan-Vickers with main line and industrial electric locomotives, multi-unit stock, automatic signalling and every type of associated equipment.*

# DIESEL RAILCARS



have now been supplied by—



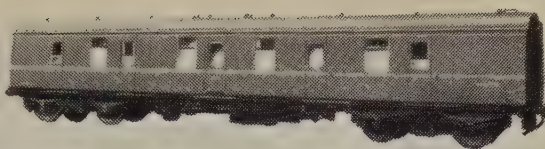
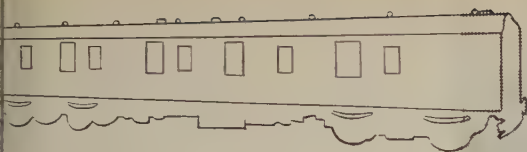
for British Railways Modernisation Plan

**METROPOLITAN-CAMMELL CARRIAGE & WAGON CO LTD**

HEAD OFFICE : SALTLEY, BIRMINGHAM, 8 • ENGLAND

LONDON OFFICE : VICKERS HOUSE, BROADWAY, WESTMINSTER, S. W. 1





# A train 300 miles long

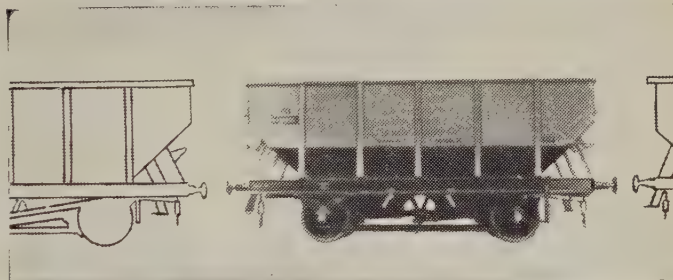
In the last eight years, Pressed Steel have produced enough railway rolling stock to make a train over 300 miles long. Rolling stock of all types, for all gauges, at home and overseas. You see some of these carriages and wagons opposite.

Clearly, Pressed Steel have enormous productivity. Their record shows it. But what the figures do not show is the store of experience built up by our designers and engineers over the last 300 miles of rolling stock. At Pressed Steel we use this experience to make sure that each wagon we produce is a sound engineering job, that it is produced as economically as possible, and in an absolute minimum of time. And we use this experience in intensive research, which will enable us to play our part in developing new and better carriages and wagons in the future.

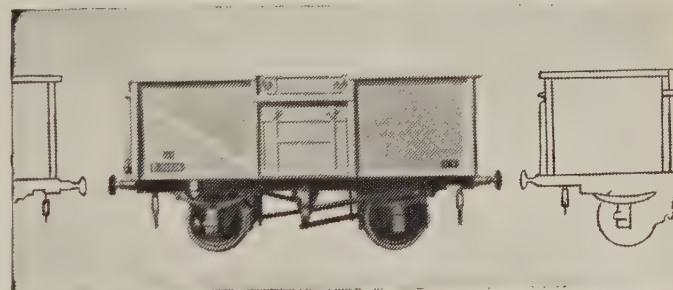
**The 58-foot Gangwayed Standard Brakevan, supplied by Pressed Steel to British Railways.**



**Broad gauge Covered Wagon type C.R., as used by Indian Railways.**



**21-ton Hopper-type Wagon with drop bottom door for minerals, as used by British Railways.**



**16-ton all steel Mineral Wagon. 74,000 of these have already been delivered from our Paisley works.**

## PRESSED STEEL COMPANY LIMITED

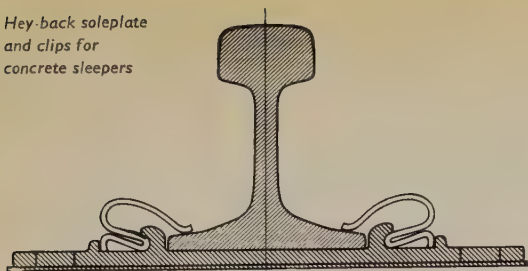


RAILWAY DIVISION, PAISLEY, SCOTLAND.  
London Office: RAILWAY DIVISION,  
47 VICTORIA STREET, LONDON, S.W.1.  
Head Office: COWLEY, OXFORD.

Manufacturers also of motor car bodies.  
Prestcold refrigeration equipment and  
pressings of all kinds.



Hey-back soleplate  
and clips for  
concrete sleepers



*railway  
fishplate  
soleplate  
steel sleeper*

# WORKINGTON



## WORKINGTON

IRON AND STEEL COMPANY

Workington • Cumberland • England

Railway Department: 8/10 Grosvenor Gardens, Victoria, London S.W. 1. Phone: Sloane 4533. Grams: Unisteels, Sowest, London

a branch of THE UNITED  
**STEEL**  
COMPANIES LTD



# MONTHLY BULLETIN

## OF THE

# INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

(ENGLISH EDITION)

PUBLISHING and EDITORIAL OFFICES : 19, RUE DU BEAU-SITE, BRUSSELS

Price of this single copy : 80 Belgian Francs (not including postage).

Yearly subscription for 1959	Belgium . . . . .	700 Belgian Francs
	Universal Postal Union . . . . .	800 Belgian Francs

Subscriptions and orders for single copies to be addressed to the General Secretary,  
International Railway Congress Association, 19, rue du Beau-Site, Brussels (Belgium).

Advertisements : All communications should be addressed to the Association,  
19, rue du Beau-Site, Brussels.

### CONTENTS OF THE NUMBER FOR JUNE 1959.

CONTENTS	Page.
I. SEVENTEENTH SESSION. — MADRID : 29th September to 7th October 1958.	
General Proceedings in Sections and in Plenary Meetings.	
SECTION II. — Locomotives and Rolling Stock.	
Inaugural Meeting of the 2nd Section . . . . .	555
QUESTION 3. — Design and improvement of railcars and multiple-unit Diesel trains, as regards: traction power equipment (location and suspension of the engine, type of transmission); characteristics of the construction (body and bogies); weight reduction; sound-proofing, heating, ventilation, air conditioning (supply of power required, advantages and drawbacks); buffer and traction gear. Intercommunication. . .	556
QUESTION 4. — Comparative study of the periodical maintenance and repair of electric locomotives, in particular as regards : the wear of the tyres (influence of the wheel diameter, the axle-load, the speed, the type of bogies and eventually undulatory wear of the rails, etc.); the maintenance of traction motors and their transmission (flash at the collectors and methods of coping with it, use of roller bearings for the suspension of the motors and the hollow shafts, etc.); lubricants used (classical and such new types as bisulphide of molybdenum); wear of the friction strips of the pantographs. Kind of work and periodicity. Organisation of the maintenance and influence of common user (banalisation) of the locomotives. Prime cost in relation to the type of equipment and the age of the engines . . . . .	609



CONTENTS <i>(continued)</i> .	Page.
II. OFFICIAL INFORMATION ISSUED BY THE INTERNATIONAL RAILWAY CONGRESS ASSOCIATION :	
Meeting held by the Permanent Commission, in Brussels, on the 7th March 1959	658
Appendix I : List of Members of the Permanent Commission. . . . .	661
Appendix II : List of Questions for discussion at the Enlarged Meetings of the Permanent Commission (New Delhi, 1959 and Brussels, 1960) . . . . .	665
Appendix III : Rules and Regulations of the International Railway Congress Association with the List of countries included in the Association . . . . .	668

## LIBRARY OF THE Permanent Commission of the International Railway Congress Association

READING ROOM : 19, rue du Beau-Site, Brussels.

Works in connection with railway matters, which are presented to the Permanent Commission are mentioned in the « Bulletin ». They are filed and placed in the library. If the Executive Committee deems it advisable they are made the subject of a special notice. Books and publications placed in the reading room may be consulted by any person in possession of an introduction delivered by a member of the Association.

Books, etc., may not be taken away except by special permission of the Executive Committee.

*All original articles and papers published in the « Bulletin » are copyright, except with the consent of the Authors and the Committee.*

*The Permanent Commission of the Association is not responsible for the opinions expressed in the articles published in the « Bulletin ».*

*An edition in French is also published.*



**BULLETIN**  
OF THE  
**INTERNATIONAL RAILWAY CONGRESS**  
ASSOCIATION  
(ENGLISH EDITION)

[ 385 (06 .112 )

SEVENTEENTH SESSION

Madrid : 29th September to 7th October 1958.

**GENERAL PROCEEDINGS**

**Section II : LOCOMOTIVES AND ROLLING STOCK**

INAUGURAL MEETING

September 30, 1958, at 9.30 a. m.

CHAIRMAN : J. RATTER

TECHNICAL ADVISER, BRITISH TRANSPORT COMMISSION,  
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

— The meeting started at 9.30 a.m.

**The President.** — Ladies and Gentlemen, the Permanent Commission of the Association has been good enough to ask me to preside over the work of the 2nd Section.

First of all, I wish to welcome you to our meetings, and I hope we shall have a fruitful and agreeable session.

The first task before us is to elect our officials. I propose we should elect as *Vice Presidents* :

Mr. P. E. N. SKOV, General Manager of the Danish State Railways, Member of the Permanent Commission of the Association;

Mr. I. A. IVANOV, Director of the All-

Union Scientific Research Institute of Railway Transport, Member of the Permanent Commission of the Association; and

Mr. L. TVETEN, Assistant General Manager of the Norwegian State Railways;

and as *Principal Secretary* :

Mr. R. SQUILBIN, Principal Engineer in the Rolling Stock and Purchasing Department of the Belgian National Railways.

(*Applause.*)

— The Section, as suggested by the **PRESIDENT**, then completed the selection of its officials, and drew up its agenda.



### QUESTION 3.

**Design and improvement of railcars and multiple-unit diesel trains, as regards :**

- traction power equipment (location and suspension of the engine, type of transmission);
- characteristics of the construction (body and bogies);
- weight reduction;
- sound-proofing, heating, ventilation, air conditioning (supply of power required, advantages and drawbacks);
- buffer and traction gear. Intercommunication.

#### Preliminary documents.

Report (America [North and South], Australia [Commonwealth of], Burma, Ceylon, Egypt, India, Iran, Iraq, Republic of Ireland, Japan, Malaysia, New Zealand, Norway, Pakistan, South Africa, Sudan, Sweden, Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and dependent overseas territories, West Germany, by Dr.-Eng. G. A. GAEBLER. (See *Bulletin* for February 1958, p. 145), and

Report (Austria, Belgium and Colonies, Bulgaria, Cambodia, Czechoslovakia, Denmark, Ethiopia, Finland,

France and French Union, Greece, Hungary, Indonesia, Italy, Lebanon, Luxembourg, Netherlands, Poland, Portugal and overseas territories, Rumania, Spain, Switzerland, Syria, Thailand, Turkey, Viet-Nam, and Yugoslavia), by A.S. CANAVEZES, Jr. (See *Bulletin* for April 1958, p. 499.)

Supplement to Report by A. S. CANAVEZES, Jr. (See *Bulletin* for August 1958, p. 1261.)

Special Report by Dr.-Eng. G. A. GAEBLER. (See *Bulletin* for September 1958, p. 1347.)

## DISCUSSION IN THE SECTION.

### Meeting of the 30th September 1958.

PRESIDENT : J. RATTER.

- The meeting started at 9.45 a.m.
- The President.** — Ladies and Gentlemen, we will now start to discuss Question 3 which deals with the design and improvement of railcars with internal combustion engines.



It is a great honour and pleasure for me to introduce to you Dr. GAEBLER, who as you know, drew up the Special Report for this question.

I will now call upon him and ask him to begin by summing up his report.

**Dr.-Eng. Gaebler, *Special Reporter*.** — Mr. Chairman, Gentlemen, it is now approximately twenty years that the International Railway Congress Association had a report submitted on railcars equipped with either Diesel or petrol engines. Since that period, it has been possible to improve the engineering technique applied to the traction power equipment and to the construction of the vehicle itself in conformity with more recent advanced engineering practice. Moreover, the employment of railcars in railway operations has, in the intervening years, experienced a quite considerable increase. The progress achieved in engineering accounts for the fact that for all practical purposes Diesel engines alone are used in present-day designs.

The International Railway Congress Association, therefore, considered these developments in the construction and improvement of Diesel railcars and multiple-unit sets significant enough to include this question in the Agenda for the XVIIth Congress.

My Colleague, Mr. CANAVEZES, and myself were invited by your Association to present a paper on this subject. A questionnaire was prepared jointly, and the replies received were sub-divided into the three following parts, similar to the sub-division used in the questionnaire.

*Part I:* General information on the use of trains hauled by Diesel locomotives and of rakes of Diesel railcars, respectively.

*Part II:* Engineering data covering Diesel railcars built between the 1st January 1946, and the 1st January 1957, or under construction or design.

*Part III:* Ideas and opinions of the Administrations concerning the design and improvement of railcars.

The special report in your possession is a synthesis of the two sectional reports.

On the basis of the information supplied by the Railway Administrations consulted it may be stated in conclusion that, even though a slight diversity of opinions and ideas exists on certain details, there is basic agreement in that their unanimous objective of using the Diesel railcar is greater economy (lower operating costs), on the one hand, and an improvement and acceleration of services and increase of travelling amenity, on the other.

With due regard to the ideas and opinions of the individual Administrations, conditioned as they inevitably are by the diversity of structure and conditions as they exist in the several countries in the national economy, industry, and transportation, the views and experiences indicated by the Administrations as relating to the development and improvement of Diesel railcars permit the following generally valid conclusions to be drawn from these reports :

a) The reporting Administrations consider the employment of Diesel railcars in passenger operations opportune, be-



cause this type of transportation shows the following favourable characteristics :

i) flexibility, permitting high utility and rapid turn-round;

ii) high average speed due to rapid acceleration, resulting from the generally favourable power to load ratio;

iii) adaptability to existing transportation needs, with the ability to maintain time-table requirements irrespective of length of train (where the design permits coupling and remote control of several units);

iv) economy, to the extent that their use is limited to the performance of specific suitable services;

b) The economy of Diesel railcar operations depends on the following factors :

i) nature of traffic demands;

ii) volume of transportation requirements;

iii) frequency of services needed.

Diesel railcars offer the greatest economy when used for moderate loads, for which reason they are used almost exclusively in passenger transportation, specifically in services with a modest demand of accommodation, and in shuttle service;

c) Within the limits set by the power output available in the motor unit, the number of seats may be adapted to existing traffic demands by the addition of ordinary or control trailers. Where suitable provisions have been made, even standard passenger coaches or goods wagons may be coupled to the motor unit. The composition of multiple-unit sets built up from several

motor units presents no difficulty, if there are wide fluctuations in traffic demands at different periods of the day, week, or season;

d) The facility of coupling several units into a set, in conjunction with the possibility of providing remote control, renders the Diesel railcar a particularly suitable instrument in services which are operated jointly as multiple-unit sets for only part of their total run, i.e., where units join the set en route or branch off at different junctions for different destinations (through carriage problem).

**The President.** — Now Gentlemen, we come to the discussion and as usual we are going to consider each of the points in the Summaries, which all of us have read, one by one, and first I will ask Dr.-Ing. GAEBLER to read out Summary No. 1 so that we can discuss it.

**Dr.-Eng. Gaebler.** *Summary No. 1 :*

1. The number of types of different designs of Diesel railcars should be limited as far as practicable. The economy of railcar operations improves with the number of completely identical units in service in the area of the Administration.

**The President.** — Now the point is open for discussion. Well, perhaps unless somebody would like to say something, I think most of us would agree that that point is self-evident and that most of us who have experience of design and operation of railcars agree with it, so if no one wishes to dispute that point I suggest it should be adopted.

— *The Summary is therefore adopted without alteration.*

**Dr.-Eng. Gaebler. Summary No. 2 :**

2. Whilst it may be necessary, for reasons of traffic requirements, to provide various types of interior arrangements and equipment, all efforts should be made to maintain uniformity of design, as relating to the most important components subject to wear and tear (as, for instance, traction power equipment, auxiliary machinery, running gear, brakes, buffing and draw gear, doors, windows, etc.).

**Mr. Tournour, French National Railways** (in French). — Mr. President, Gentlemen, in the French text the word « motorisation » does not seem to me to be used in the generally accepted sense.

Consequently, I suggest that we replace it by « equipment moteur ».

This change will have to be made in a certain number of the summaries, as this is a term which is repeated fairly frequently.

**Mr. C. Martin, French National Railways** (in French). — Mr. President, Gentlemen, I am in complete agreement with the text of Summary No. 2.

Obviously, a criticism might be made of the fact that the components mentioned in parenthesis as being difficult of maintenance are not all of the same importance from the point of view of standardisation of design.

It is certain that standardized designs are more important in the case of the motor equipment and certain auxiliaries than in the case of the doors and windows.

But rather than burden the text of this Summary, I have no objection to it being agreed as it stands.

**Mr. Squilbin, Principal Secretary** (in French). — So no modifications need be made to it, Mr. MARTIN ?

**Mr. Martin** (in French). — No.

**The President.** — Would it help Mr. MARTIN if we were to put — to infer that doors and windows are different — the sentence worded as follows : (traction power equipment, auxiliary machinery, running gear, brakes, buffing and drawgear, and such items as doors, windows, etc.) to demonstrate that there is a difference between the items. Are there any other Delegates who would like to speak on this Summary No. 2 ? Well, if not, I declare it adopted, subject to the minor alteration in the wording which we have heard.

— *The following text was adopted :*

« 2. Whilst it may be necessary, for reasons of traffic requirements, to provide various types of interior arrangements and equipment, all efforts should be made to maintain uniformity of design, as relating to the most important components subject to wear and tear (as, for instance, traction power equipment, auxiliary machinery, running gear, brakes, buffing and draw gear, as well as certain details, such as doors, windows, etc.). »

**Dr.-Eng. Gaebler. Summary No. 3 :**

3. The installation of a single traction power unit (Diesel engine plus its transmission) in each motor unit is the more economical method, if suitable equipment with the necessary power output is available on the market.



The installation of two separate units, for reasons of operating reliability, is no longer necessary, in view of the present high standard of design and manufacturing technique.

A subdivision of the total power output in *two* separate units may be opportune for the following reasons:

- (a) limitation of types of mechanical equipment in use;
- (b) to permit the installation of two smaller underfloor engines instead of a single large unit which, due to its size, would have to be mounted in the car body, in order to profit from the gain of space (for passenger accommodation) obtained by this solution;
- (c) to permit the utilization of engines and/or transmissions available from mass production of the motor vehicle industry, thus benefiting by the relatively low first cost and maintenance charges for spare parts.

A division of the power unit in two may also become inevitable, if a high power requirement makes the installation of a single unit impracticable.

**Mr. Tourneur** (in French). — Instead of « élément moteur » in the second and third lines of the French text, I suggest we say: « élément automoteur ».

**Mr. Squilbin** (in French). — The modification suggested by Mr. TOURNEUR, i.e. replacing the words « élément moteur » by « élément automoteur » only applies to the French text. We think, in fact that the English expression « in each motor unit » complies with Mr. TOURNEUR's idea. So there should not be any modification in the English text.

**The President.** — I think that only affects the French text and what is suggested is not applicable to the English text, « motor unit » covers it.

**Mr. Tourneur** (in French). — I would like to make it clear that, by analogy with the English text, we might say « unité motrice » in the French text, which would be just as clear.

**Mr. Squilbin** (in French). — Consequently, we will say « unité motrice » in the French text, to keep the two texts in line with each other.

**The President.** — I think that point is acceptable.

**Mr. Alström**, *Swedish State Railway*. — Under point 3 b) it said that it would permit of two smaller underfloor engines... I would suggest the elimination of the word « underfloor », as I cannot see that it is really necessary to have this word in the text. The question of an underfloor motor or a motor of other design is a question of the height of the floor of the railcars and that is another question, so I would like to suggest the elimination of the word « underfloor ».

**Dr.-Eng. Gaebler.** — By saying here « underfloor » I do not want to make any allusion to any constructive characteristic of the engine but merely I wanted to point out its disposition below the floor as opposed to above the floor, in which case the machine is extending into the inside of the car body.

**Mr. C. Martin** (in French). — In Summary No. 7, mention is made of mounting the power equipment under the floor, and in the reports it is made clear that such mounting under the floor is limited to the low and average powers.

I am therefore in complete agreement with Mr. ALSTRÖM's suggestion to suppress the words « under the floor » in paragraph *b*).

However, if « under the floor » is no longer mentioned in this paragraph *b*), this simply duplicates the last sentence of Summary No. 3 which says : « A division of the power unit in two may also become inevitable, if a high power requirement makes the installation of a single unit impracticable ».

In conclusion, I suggest :

— either the suppression of paragraph *b*) and the retention of the last paragraph of the Summary;

— or the suppression in paragraph *b*) of the idea of mounting under the body, and also the suppression therefore of the last paragraph of Summary No. 3.

**The President.** — Dr. GAEBLER, what do you say about that ?

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I would like to make a suggestion if you please.

I recognise that the arguments which have just been put forward in favour of suppressing the mention of mounting under the floor in this paragraph are justified.

Consequently, so as not to interfere with the cohesion of the text of Summary No. 3, could we not simply refer to Summary No. 7 in paragraph *b*).

This would give us, at the end of the sentence :

« A division of the power unit in two may be advisable for the following reasons :

*a*) ...

*b*) for the reasons explained in the first paragraph of Summary No. 7. »

**Mr. Tourneur** (in French). — Gentlemen, for my part I still think it would be better to suppress paragraph *b*) purely and simply.

In effect, in the special report it is stated that the maximum power installed under the floor at the present time is of the order of 450 HP.

I therefore do not think that fundamentally it would be possible to reduce the space taken up under the floor by mounting two units instead of one.

To sum up, I suggest :

— we retain paragraph *a*);

— we retain paragraph *c*);

— we suppress paragraph *b*);

— and we retain the last paragraph of Summary No. 3.

The idea « under the floor » will only be retained in Summary No. 7.

**Mr. Alström.** — I am in agreement with Messrs. MARTIN and TOURNEUR to omit point *b*) but then I should like to suggest in the last paragraph of Summary No. 3 the word « high » be omitted too. We could say : « ... the power requirement makes the installation of a single unit impracticable », so omit the word « high ».

**Mr. Navarro**, *Spanish National Railways* and *Secretary to the Section* (in French). — Gentlemen, I am also in favour of suppressing paragraph *b*), for the following reason :

It is stated in this paragraph *b*) :



« ... this solution makes more space available in the body », and in the last paragraph :

« ... if power requirements make the installation of a single unit impracticable. »

It seems to me that these are two completely different matters. (*Sign of agreement from the Special Reporter.*)

**The President.** — I wonder if the best way here is to do as Dr. GAEBLER suggests, to accept the modification which has been proposed, which is to eliminate *b*) but to bring into Summary No. 7 this idea which we have been discussing and perhaps discuss it when we come to this Summary No. 7. That covers the point you raised Mr. ALSTRÖM, we will do it that way.

**Mr. Alström.** — The question of the « high » power, I should prefer to suggest to make the English text « if power requirements make the installation of a single unit impracticable ».

**Mr. Squilbin** (in French). — The French text will therefore read :

« A division of the power unit in two may also become inevitable, if power requirements make the installation of a single unit impracticable. »

Does this text meet with the approval of Messrs. MARTIN and TOURNEUR ?

(*Signs of agreement from Messrs. MARTIN and TOURNEUR.*)

**The President.** — It is implied that it is a high power, but not very high power, I think Dr. GAEBLER agreed that.

Well, then the proposal is, and I think it is agreed that we should adopt it, omit paragraph *b*) and make the small alteration so as to adjust the point to the last paragraph, keeping in our minds this discussion when we come to Summary No. 7, otherwise I think I may say that with this modification Summary No. 3 should be adopted. Thank you, Dr. GAEBLER.

— *The following text was adopted for Summary No 3 :*

« 3. The installation of a single traction power unit (Diesel engine plus its transmission) in each motor unit is the more economical method, if suitable equipment with the necessary power output is available on the market.

« The installation of two separate units, for reasons of operating reliability, is no longer necessary, in view of the present high standard of design and manufacturing technique.

« A subdivision of the total power output in two separate units may be opportune for the following reasons :

« (a) Limitation of types of mechanical equipment in use;

« (b) To permit the utilization of engines and/or transmissions available from mass production of the motor vehicle industry, thus benefiting by the relatively low first cost and maintenance charges for spare parts.

« A division of the power unit in two may also become inevitable, if power requirements make the installation of a single unit impracticable. »

**Dr.-Eng. Gaebler.** — *Summary No. 4 :*

4. High speed engines are, as a rule, preferable for use in Diesel railcars for the following reasons :

- (a) dimensions are smaller, thus requiring less space for a given power rating and facilitating the installation;
- (b) the engine has less weight, and component parts are correspondingly lighter and, consequently, are generally less expensive.

**Mr. Boulanger,** *Belgian National Railways* (in French). — Mr. President, Gentlemen, the end of paragraph b) :

« ... their components parts are correspondingly lighter and consequently are generally less expensive » may give the impression that it costs less to maintain a high speed engine than a low speed one.

If it is desired to mention the cost of the components, mention should also be made both of the frequency with which they have to be replaced and also the other factors, such as labour, etc., which affect maintenance costs.

I think that at the present time it is premature to express a definite opinion on the comparative cost of low speed and high speed engines.

For this reason, I suggest we suppress the last part of the sentence 'generally less expensive' and mention for example the ease with which components can be handled by saying : such components are easier to handle. »

**Mr. C. Martin** (in French). — Mr. President, Gentlemen, perhaps we could simplify Summary No. 4 by just stating :

« As a general rule, high speed Diesel

engines are preferred because their dimensions are smaller, they are easier to install and their weight is less. »

**Dr. Gaebler** (in German). — Mr. President, Gentlemen, I agree that the wording which has just been suggested for Summary No. 4 does not alter the sense, and consequently I may state I am in agreement with this text.

**Mr. Boulanger** (in French). — I am also in agreement with this suggestion.

**Mr. Squilbin** (in French). — According to Mr. MARTIN's suggestion, the final text will therefore read as follows :

« 4. High speed Diesel engines are, as a general rule, preferable for use in Diesel railcars because their dimensions are smaller, they are easier to mount and their weight is less. »

**The President.** — Any point on that particular part of the paragraph ?

No — any other points on any other part of Summary No. 4 ? I declare Summary No. 4, subject to the amendments which have been read out, adopted.

**Dr.-Eng. Gaebler.** — *Summary No. 5 :*

5. Supercharging of Diesel engines (provided the design is suitable), and in particular of 4-stroke engines of medium and relatively high rating, may be recommended for the reason that a notable increase in power — up to 50 % — may be obtained at the cost of a relatively modest increase in load and thermal strain.

**Mr. Maass,** *South African Railways and Harbours.* — At present, I suggest



we should drop the reference to 50 %, it should be left entirely as a fact that we do gain.

**The President.** — Because there might be many opinions on 50 % ?

**Mr. C. Martin** (in French). — In my opinion, it would be better to give a figure; this will show the present stage reached. Perhaps, a higher figure will be reached in the future, but at the present time I think the right figure is 50 %.

**The President.** — Dr. GAEBLER, I suppose you put in 50 % because certain Administrations said that was what they were obtaining ?

**Dr.-Eng. Gaebler** (in German). — If my memory is right, it was for this reason that I indicated this in my report. By reason of technical advances by supercharging, even higher increases in power of engines is possible, although it is true that this only applies to the engines of certain Administrations and it does not appear to apply to small or medium power engines for technical and economic reasons but only for engines of about 500/600 HP and above. If I may add, nevertheless, I do not see any objection to leaving out any reference to specific figures since percentages are indeed widely separated.

**The President.** — Mr. MAASS, would you like to add anything to it ?

**Mr. Maass.** — No, Mr. President, if the Special Reporter likes to retain, say

50 %, I suggest that he adds « in the higher power ranges ».

**Mr. C. Martin** (in French). — For my part, I would vote in favour of this second solution and say « up to 50 % and for high powers ».

**The President.** — Is that acceptable to you Dr. GAEBLER ?

**Dr.-Eng. Gaebler.** — Yes, I think.

**Mr. Squilbin** (in French). — The final part of the Summary will therefore be worded as follows :

« ... a notable increase in power may be obtained (up to 50 % in the higher power ranges). »

**The President.** — Any other objection ?

— *The Section adopted the following text for Summary No. 5 :*

« 5. Supercharging of Diesel engines (provided the design is suitable), and in particular of 4-stroke engines of medium and relatively high rating, may be recommended for the reason that a notable increase in power — up to 50% in the higher power ranges — may be obtained at the cost of a relatively modest increase in load and thermal strain. »

**Dr.-Eng. Gaebler.** — *Summary No. 6 :*

6. It is generally preferable to use 4-stroke engines, because the benefits derived from supercharging are more effective with this engine design.

**Mr. da Cunha Monteiro**, *Portuguese Railway Company* (in French). —

Mr. President, Gentlemen, I suggest we suppress Summary No. 6 seeing that in Europe, we only have experience of four stroke engines.

There certainly are two stroke engines — but not in Europe — which, taking maintenance into account, may have advantages over four stroke engines.

Therefore, I think this Summary No. 6 could be suppressed without the slightest drawback.

**Mr. Boulanger** (in French). — If more four stroke engines are used in Europe, I think this fact is due to there being far more of them on the market than there are two stroke and very few builders make these latter.

In consequence, I suggest :

— either the suppression of Summary No. 6 as Mr. DA CUNHA MONTEIRO suggested;

— or replacing the statement :

« ... preference should be given to four stroke engines... »

by :

« ... four stroke engines are most widely used... » which would simply be an acknowledgment of the actual position.

**The President.** — I think the points would be either Mr. BOULANGER would like to delete it or add « on present experience ».

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I think the time has come to clear up a few points of principle in connection with the report.

In effect, the summaries before you were based on the replies received from the Administrations.

I know — and the same applies to some of the other questions — that in certain countries, especially overseas countries such as the United States, other principles of design have been successfully used, especially in the case of two stroke engines instead of four stroke.

But in drawing up my report I considered that I should base my statements solely upon the information contained in the replies which I received from the Administrations consulted.

From this point of view, I can affirm — and confirm — that in actual fact four stroke engines are used almost exclusively.

On the other hand, I am in favour of the wording suggested by Mr. BOULANGER; it is closer to reality and does not greatly alter the meaning of the summary in question.

**The President.** — I think if I may say so, that is an important point, Summary No. 6 as I understand it, says what various Administrations have told Dr. GAEBLER. It is difficult, therefore, to depart from that, but one proposition has been that the words « Present experience has shown that... » should prefix Summary No. 6. I think that would be agreeable to you Dr. GAEBLER ?

**Dr.-Eng. Gaebler.** — Yes.

**Mr. Martin.** — Mr. President, are we going to keep the last part of the summary :



« ... because the benefits derived from supercharging are more effective... ? »

**The President.** — Dr. GAEBLER, I think you had better answer.

**Dr.-Eng. Gaebler** (in German). — This is quite an engineering question indeed it is well-known that two stroke engines may be supercharged, especially two stroke engines with valves, but the degree of supercharging is limited by the high thermal strain imposed on a two stroke as compared with a four stroke and I would ask you Mr. CHAIRMAN to consult the Assembly on this point.

**Mr. Tourneur** (in French). — I am fully in agreement with Dr. GAEBLER'S opinion, and consequently I suggest we end Summary No. 6 by saying :

« ... preference is given to four stroke engines which make it easier to take advantage of supercharging. »

*(Sign of assent from the Special Reporter.)*

**The President.** — Are all the delegates satisfied ? Does anyone want to say something ? I think we had better read the English text out :

« 6. Present experience shows that preference is generally given to 4-stroke engines which more easily permit the advantages of supercharging to be applied. »

— *The French text was given by Mr. SQUILBIN.*

**The President.** — Summary No. 6 is

therefore adopted and we will go on to Summary No. 7.

**Mr. Boulanger** (in French). — Excuse me interrupting before we go on to Summary No. 7, but I would like to point out that Summaries Nos. 4, 5 and 6 dealing with Diesel engines make no mention at all of the cooling system.

As the air cooling system might be of interest to certain Administrations, I suggest to add a few words on this point in a new summary, which should be added to the others.

We could say, for example :

« As a general rule, the engines are water cooled up to the present time, air cooled engine only having been used to a limited extent for low powers. »

**The President.** — Would you like to say something on that, Dr. GAEBLER ?

**Dr.-Eng. Gaebler** (in German). — I think it could be mentioned here because in the main reports the cooling systems were discussed.

**The President.** — There is a reference in Summary No. 11, but not in the sense Mr. BOULANGER said.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, cooling is certainly dealt with in Summary No. 11, but merely in connection with the steps to be taken to prevent corrosion and erosion, the formation of scale and other deposits and antifreeze devices.

Perhaps the addition suggested by Mr. BOULANGER could be included in Summary No. 11.

**The President.** — As an introduction to Summary No. 11, would that cover your point Mr. BOULANGER? (*Agreed.*) Well, we will keep that in mind for Summary No. 11, and we will go on to Summary No. 7.

**Dr.-Eng. Gaebler.** — *Summary No. 7 :*

7. The underfloor arrangement of the tractive power equipment should be used for small to medium ratings, as it provides more space for the payload in the car body.

Accessibility of the underfloor power unit is of great importance, but this can be arranged without difficulties.

The tractive power equipment of medium to high rating may be installed either in the bogie or in the car body. Installation in the bogie offers the advantage of facilitating the exchange of the entire power unit, inclusive of its bogie, whilst the installation in the car body insures a better accessibility of the power unit even in operation.

The protection of the power unit against bad weather conditions and dirt, as well as a more efficient noise insulation are more easily realized with the installation of the engine in the car body.

**Mr. Martin** (in French). — I would like to ask Dr. GAEBLER a question to begin with, and that is whether it would not be advisable to make quite clear in the first words of Summary No. 7 what is meant by « low and average powers ».

For example, ought we not to say « up to 450 or 500 HP » so as to give the figures which have been indicated in the two reports by Dr. GAEBLER and Mr. CANAVEZES?

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, in effect we might add some such explanations, referring to what is said on page 1352 of the special report (English edition) under « c). Designs and types of rail-

cars » in which three groups of Diesel railcars are defined, giving at the same time the corresponding installed traction power.

**The President.** — Referring back to the powers set out in the English text.

**Mr. Squilbin** (in French). — In order to take into account Mr. MARTIN's remark I suggest putting in parenthesis « up to 500 HP », so that it will read :

« ... both for small and medium ratings (up to 500 HP). »

**Mr. Martin** (in French). — About.

**Mr. Squilbin** (in French). — So we will say : « (Up to about 500 HP) ».

**The President.** — Agreed? (*Sign of assent from the Special Reporter.*)

**Mr. Stagni, Ministry of Transport, Italy** (in French). — Mr. President, Gentlemen, I suggest we delete the word « primordial » in the sentence :

« The accessibility of the power equipment under the floor is of *primordial* importance, but it can be arranged without difficulty. »

The word « primordial » which means of great importance is translated in the English text by « of great importance ».

I think the need for the engine to be accessible is too obvious for all positions, and not only when the engine is under the floor, and consequently I suggest we should limit the text to :

« The accessibility of the power equipment under the floor can be arranged without difficulty. »



**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, in the second paragraph, it is also question of the accessibility of power equipment of higher ratings.

To take into account the suggestion just made, we could start by saying how important the question of accessibility is for every type of engine, which would only have to be characterised in the following sentences.

I think this is merely a question of finding the right text which we can leave to the Secretaries, who will submit it to the meeting at the next session.

**Mr. Alström.** — The question of the underfloor arrangement is the question of the different sizes of railcars. In Sweden and Finland, we are using to a large extent railcars for branch lines with very low floors in an endeavour to avoid building platforms to a large extent and for that reason we have no possibility of placing the motor under the floor. We have a wheel diameter of 670 mm and that is a very small wheel diameter. For that reason, I would like to suggest that the first part of Summary No. 7 should be a little altered to say « the underfloor arrangement of the tractive power equipment should be used for low and medium ratings in order to provide more payload in the car body with the exception of the necessity to have very low floor height and for that reason mount the motor in the body ». I think that with a floor height of 850 mm, it is impossible to have the underfloor arrangement.

**Mr. Maass.** — Regarding the question which has been raised, I do not think it wise to specify an actual dimension, I think the words « where practicable » would be better.

**Mr. Stagni.** — In my opinion we should define the height of floor which prevents the power equipment being fitted under the floor.

For example, we have built railcars with engines under the floor, with a floor height of up to 1 150 mm, for standard gauge lines, for secondary railways.

I do not know if Mr. ALSTRÖM is referring to the height of the inside floor.

**Mr. Alström.** — 850 mm.

**Mr. Stagni.** — We could say: « Under one metre ».

**Mr. Alström.** — 1 150 mm is very high.

**The President.** — The point here is really quite a simple one, there are some railcars which have the floors so low you cannot get the motor under them and, therefore, you would like that mentioned in the text. That is a simple point and it could be covered. Dr. GAEBLER would like to have a slight revision of the text to cover the point raised by the Assembly, and unless there are any other points, I propose we revise it and present it to the meeting tomorrow.

**Mr. Maass.** — With regard to the point « accessibility », I should like to

stress here that the conclusions are read by two sets of people, i.e. customers and designers. The customer wants accessibility and the designer only wants to get the thing in. Would Dr. GAEBLER also cover this from the user's point of view?

**The President.** — From the point of view of maintenance, accessibility is of great importance, but we will try to put these words quite clearly in the revision. Are you satisfied Dr. GAEBLER.

**Dr.-Eng. Gaebler.** — I agree.

**Mr. Martin.** — May I insist that in the new wording that will be adopted the words « the power equipment must be fitted under the floor » will not be retained.

I think this is much too definite a statement, and the different points of view put forward during this discussion should be taken into account, the importance of the height of the floor, accessibility, etc., simply by enumerating the advantages, the various difficulties and the different precautions that must be taken.

**The President.** — In English, it could be covered that the provision of under-floor engines allows greater pay load without saying that it should be used. The facts could be stated, many people feel you should get as many passengers in the coach as you can. Could you say something on that point to take away the « should be ».

**Dr.-Eng. Gaebler** (in German). — I think that this point should not be

given as a condition but nevertheless it is important so that I would express it in somewhat the following way.

« We should endeavour by all means to effect this underfloor arrangement because of its economic advantages. »

**The President.** — I think Mr. MARTIN we could cover your point and still show that the additional space provided is economical without saying it must be given. If you will leave it till tomorrow I will try to agree some words with Dr. GAEBLER which will cover your point.

It is understood that a new text taking into account the various remarks will be submitted to the Assembly at our next meeting. (*Agreed.*)

**Dr.-Eng. Gaebler.** — *Summary No. 8 :*

8. The following transmission systems are suitable :

- (a) mechanical or hydraulic transmissions, or combinations of the two systems, for low power ratings;
- (b) mechanical or hydraulic transmissions for medium power ratings; the superiority of the hydraulic transmission rises in proportion with the increase in power output; the electric transmission becomes feasible as the power rating approaches the upper range of this category;
- (c) hydraulic or electric transmissions exclusively for high power ratings.

**Mr. Boulanger.** — To conform with the definitions given by the O.R.E., I suggest we say in paragraphs :

« a) ... mechanical, hydraulic or *hydromechanical* transmissions... »;

« b) for average ratings, mechanical, *hydromechanical* or hydraulic transmissions... »



*(Sign of assent from the Special Reporter.)*

**The President.** — That I think would be agreeable. Any other point on Summary 8? I declare that adopted, subject to that remark.

**Dr.-Eng. Gaebler.** — *Summary No. 9 :*

9. The position of the power unit (Diesel engine with its transmission) in the railcar is influenced by :

- (a) type and location of the Diesel engine, and
- (b) choice of transmission system.

Both the mechanical and hydraulic transmissions require a more restricted layout of engine, transmission, and driving axles.

The electric transmission on the other hand, allows greater freedom in the arrangement of the power unit with its generator and the axle drives (traction motors).

**The President.** — Any remarks on that text?

**Mr. Alström.** — I do not know whether it would be usual in this summary to say anything about the different characteristics of our mechanical or electrical transmission systems as regards the use of adhesive weight. As most hydraulic transmissions have the axles coupled so we are using only adhesive weight but most electrical systems up to now are not using adhesive weight as efficiently as hydraulic or mechanical systems.

**The President.** — This summary really is dealing with the position, the physical design question, I cannot remember whether weight is mentioned elsewhere. Dr. GAEBLER could give us his opinion on this question.

**Dr.-Eng. Gaebler** (in German). — If I have understood Mr. ALSTRÖM aright, he is asking whether it would not be as well to speak of the utilisation of the adhesive weight.

May I say a few words about this subject.

The question of the transmission, especially in the case of electric and hydraulic transmissions, is very complex and really could be the subject of a whole report by itself.

Perhaps, it is premature to formulate at this date any definite conclusions regarding the experience acquired and the advantages and drawbacks of the different systems available. The whole lot must be considered, especially the systems of transmission used on locomotives.

That is why I restricted myself in the report before you to an illustration of the situation as it appears from the replies received from the different Administrations, and I suggest we do not go into details about this matter, as regards the advantages and drawbacks, unless there is sufficient time.

Perhaps, it would be useful to put off till later a discussion on the question of Diesel hydraulic and specific Diesel electric transmissions.

**The President.** — Mr. ALSTRÖM is your point as wide as that or do you mean that generally electric transmission is heavier than hydraulic?

**Mr. Alström.** — I only would remark that there are stated some drawbacks and some good things of the various systems but there is nothing said about the

most intricate question, that is the question of adhesive weight utilisation and I would, therefore, suggest that to say some few words on the question of utilisation of adhesive weight or something like that so that no customer or user can say « they forgot this very important question » — some few words.

**The President.** — Would you like to put a few words in there to say that the question of weight is not covered?

**Mr. Alström.** — I would like to suggest to say, only for example, the question of adhesive weight to be utilised for the different systems is not stated in this report.

**Mr. Tourneur** (in French). — Mr. President, Gentlemen, I think that the question of adhesion would merit attention above all if locomotives were included in our agenda; it appears to me a somewhat secondary problem when dealing with railcars.

Consequently, I share Dr. GAEBLER'S opinion on the advisability of not discussing the various considerations involved in the subject of the transmissions.

**Mr. Alström.** — I do not quite agree with Mr. TOURNEUR as our experience with driving railcars is a very intricate problem as regards the utilisation of adhesive weight, the question is similar to the utilisation of adhesive weight for locomotives but I think, as my colleague Mr. MAASS, also of the customers using these notes and finding nothing said about the utilisation of adhesive weight but only about the placing of motors and the arrangement

which electric transmission gives and other things. I would like to mention only in a few words that we have not here studied this question of adhesive weight utilisation.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, to take into account M. ALSTRÖM'S suggestion, I suggest we add a further summary which might be worded something like this. I insist on something like :

« The advantages from the operating point of view of the different systems of transmission have not been the subject of a study devoted to this question. For this reason they have not been dealt with, as this would have taken up too much space »,

or something of the sort.

**The President.** — It is a statement of fact and presumably Mr. ALSTRÖM you would not raise objection to that.

**Mr. Alström.** — I am satisfied.

**Mr. V. Ivanov**, *U. S. S. R. Railway Transport Ministry* (in Russian). — Although the question about the different types of transmission is very complicated, we can see it is very important and necessary to include in the report different details about the use of different types of transmission, hydraulic, mechanical and electrical transmissions.

**Dr.-Eng. Gaebler** (in German). — Comparisons concerning the engineering details and characteristics of the three transmission systems mentioned requires long deliberation but if the Assembly



wishes it, I could work out a proposal for a wording which I could submit to you tomorrow in a brief form. For the moment, I think it would be difficult and require too much time to discuss the question without having an idea of a definite proposal for wording.

**The President.** — I think it would be difficult for Dr. GAEBLER to make a full statement comparing the qualities of the three transmissions to go into this report, but I think probably we could produce a short statement which would not, however, reach finality. Would a short statement like that satisfy Mr. IVANOV?

**Mr. V. Ivanov** (in Russian). — If it is not possible to examine the different types of transmission in detail, I will agree to Mr. GAEBLER's suggestion.

**The President.** — We will have something for you tomorrow on this point. To sum up, the modifications to be made to Summary No. 9 are as follows: a short sentence should be included dealing with the question of the adhesive weight, suggested by Mr. ALSTRÖM, and in addition, as regards the much vaster question which we have to discuss, some small additional sentence must be found about the possibilities of the three types of transmission and experience acquired in this connection.

**Dr.-Eng. Gaebler** (in German). — I suggest adding, as far as the second point is concerned, a short sentence to Summary No. 8 which mentions the three systems.

**The President.** — (*Agreed.*) A revised text for Summary No. 8 will also be presented at our next meeting.

**Dr.-Eng. Gaebler.** — *Summary No. 10:*

10. In order to ensure the proper functioning of the power unit in operation and to enable suitable measures to be taken in the event of a breakdown, the installation of suitable supervisory instruments to be watched by the driver or of automatic control apparatus is to be recommended, covering for instance, the engine coolant temperature, engine coolant reserve, oil pressure, and oil temperature.

Automatic control has the advantage that it:

- (a) is continuous so that it becomes immediately operative in case of failure, and
- (b) leaves the driver free for the performance of his other duties as they relate to train operation, etc.

Its drawback is a somewhat higher expenditure for first cost and maintenance.

Traction power installations of high rating, which are necessarily expensive, warrant the installation of automatic control apparatus.

Alarm apparatus or indicators of a more simple design should prove adequate for less costly power equipment operating under less exacting conditions.

**Mr. Maass.** — The question of how much instrumentalisation is to be brought to the driver's attention is one which must be given very careful consideration. The driver's job is to watch his track and get his train through and I think we must specify nothing like this in a conclusion. I think we should specify the instruments provided for the driver, the less the driver has to watch the better it is.

**Mr. da Cunha Monteiro.** — May I draw your attention to the possibility

of having automatic controls which are not controlled by the driver from his driving desk.

All these automatic devices can be in the engine compartment and the driver has no need to do anything about them, which greatly simplifies driving multiple units.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I think we can whole heartedly agree with the point of view expressed by Messrs. DA CUNHA MONTEIRO and MAASS.

In effect, thanks to modern technique, it is possible to make equipment of great reliability and relatively low cost, allowing of automatic control of the essential functions of the power equipment, and it is advisable to make the greatest possible use of such equipment.

The only essential requirement is that the engine crew should be advised by means of a pilot light if anything goes wrong or there is any breakdown, in order to be able to determine immediately the nature of the trouble.

Should the control equipment go wrong, a simple shunt device makes it possible to cut out the trouble till the end of the run.

**The President.** — I think Mr. MAASS and Mr. DA CUNHA MONTEIRO, the main point that you wish to bring out is that the driver should have as much of his attention as possible on the track and on his driving and if fitted with automatic control in his cab it should be as simple as possible.

**Mr. Mass.** — I think we are satisfied with what we consider as essential instruments, speed recorder and brake dials, must be there of course, and in addition the tachometer for his engine. Beyond that I do not consider it is necessary for the driver to have any visual information of what is happening.

**The President.** — I think it would be very difficult to agree a draft sentence here and I think we had better use the time honoured procedure and place one before you tomorrow. Is that agreeable, Dr. GAEBLER ?

**Mr. Alström.** — This is a little question about the automatic control. The principle of using automatic instruments as far as possible with current uninterrupted in other cases than by failure, you should remember we have low current, I think it would be advisable to state that automatic instruments would be preferably of a type of low current construction.

**The President.** — Are there any other comments about Summary No. 10 ?

We still have to complete the text of this Summary and the revised wording will be submitted to you at our next meeting.

**Dr.-Eng. Gaebler.** — *Summary No. 11:*

11. Water-cooled Diesel engines make protective measure of the cooling system advisable against:

- (a) corrosion and erosion;
- (b) scale formation and incrustation;
- (c) freezing during the cold season.



As suggested by Mr. BOULANGER, this Summary will be preceded by a brief remark about systems of cooling by air or by water.

**The President.** — Subject to that, any point to be raised on Summary No. 11 ?

**Mr. Maass.** — With regard to paragraph a) : corrosion and erosion, to what extent is it visualised that treated water is to be used ? If fully treated water is to be used which covers corrosion and erosion, it should be stated.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, unfortunately we did not include the special question of the method of treating the water in the questionnaire; therefore we did not get any replies about this.

The modern technique for treating the water constitutes a special field requiring special knowledge and it could not be dealt with in a few words.

Today for example we know that erosion is caused as a result of transversal stresses acting on the cylinder walls and such erosion cannot be eliminated by just any treatment of the water but requires special remedies which we might say will deposit an elastic protective coating between the metal and the water.

I am merely saying this as an example. I think that this also is too vast a subject to be gone into thoroughly during the present discussions.

**Mr. Maass.** — I quite agree with Dr. GAEBLER's statement but I do feel that the opening sentence of Summary

No. 11 is somewhat misleading. We talk of cooling systems and it is an important matter to which I am drawing attention, whether the water should be wholly treated or not.

**The President.** — Would you suggest that the point would be covered, Mr. MAASS, if we say « protected by means of water treatment... » ? We are only dealing with the system through which the current flows. You want to say by an acceptable water treatment, I think Dr. GAEBLER it would be simple to add the words « by water treatment ».

**Dr.-Eng. Gaebler.** — I think there is no objection to this.

**The President.** — You would be agreeable to that. Then by the addition of those three words « by water treatment ».

**Mr. Maass.** — That is my suggestion.

**Mr. Collins, Coras Iompair Eireann.** — If the addition « by water treatment » is made to the Summary, should we not delete erosion from sub-paragraph a) ?

**The President.** — Addition of « by water treatment », should not the word erosion be deleted ?

**Mr. Martin** (in French). — Perhaps we could say :

« a) erosion;

« b) corrosion, the formation of scale

and deposits, in particular by the treatment of the water;

« c) ice. »

I might add that in my personal opinion, there are a lot of protective measures which have to be taken all the time.

Consequently, in spite of their importance, I do not think we can mention any one of them.

**The President.**— The point Mr. MAASS is: would you accept the text as it is so that it is more general. I think it is understood that water treatment is a large feature here but it seems there are other things making a short statement too complex.

**Mr. Mass.** — I am quite prepared to accept the feeling of the Assembly and leave it open.

**Dr.-Eng. Gaebler** (in German). — I do not wish to oppose Mr. MARTIN's proposal. I must however point out on the one hand that corrosion can be not only chemical in origin, but also electrical, and on the other hand, erosion can be prevented not only by additions to the water, but also by metallic coatings. Certain of these remedies are in fact still very controversial.

**Mr. Martin** (in French). — I quite agree with Dr. GAEBLER. That is why my final suggestion was to leave the text of Summary No. 11 as it is, without adding anything.

**The President.** — Mr. MAASS, do you agree with this proposal?

**Mr. Maass.** — I signified that I agreed.

**Mr. Squilbin** (in French). — With the addition of a sentence about the system of cooling, Mr. MARTIN?

**Mr. Martin** (in French). — No, nothing.

**The President.** — No other objections to Summary No. 11? In this case we will consider it as adopted. As agreed, and as Dr. GAEBLER has confirmed, this Summary will be completed by an additional paragraph which will be submitted to the Meeting at our next session.

**Dr.-Eng. Gaebler.**— *Summary No. 12:*

12. For hydraulic transmissions with coupling characteristics and for mechanical transmissions, the inclusion of a protective device for the engine against overspeeding through torque exerted by the driving axles is to be recommended.

**The President.** — Any comments?

— *Summary No. 12 is adopted without modification.*

**Dr.-Eng. Gaebler.**— *Summary No. 13:*

13. The driving position(s) of Diesel railcars and their control trailers, if any, and of multiple-unit sets, respectively, should be arranged in such a manner that:

- (a) a good visibility is ensured;
- (b) the travelling direction may be reserved without turning the vehicle.

These conditions are most satisfactorily fulfilled with the driving position(s) arranged at the end of the vehicle.

But the provision of a single driving position at a high enough level either at one of the ends or at about the centre of the railcar also ensures a satisfactory visibility, even if a trailer is running ahead



of the motor unit, provided the vehicles are not excessively long.

High-level end-driving positions can afford greater safety to the driving staff, especially in such cases where part of the power unit is built into the car body immediately in front of the driving position at the level at which an impact with possible obstacles on the track might occur.

Care should be taken in the design of the driving position to ensure that the driver is protected from eye strain due to the inclusion in his line of vision of the track passing directly beneath his eyes.

The provision of a driving position at each end of the set suffices for twin or multiple-unit sets, the components of which are never used separately.

**The President.** — Any point on Summary No. 13 ?

**Mr. Tourneur** (in French). — Gentlemen, in the third paragraph from the end, instead of :

« Raised driving compartments at the ends *may offer* greater safety... », I suggest we say :

« When two driving compartments are used, raised compartments offer greater safety... »

In effect, I think this is the general rule.

**The President.** — I think we will accept that. Any other point ? Subject to that one point we accept Summary No. 13, and there I propose to close our meeting and we meet again tomorrow morning at 9.30 a.m.

*The final text adopted for Summary No. 13 was worded as follows :*

« 13. The driving position(s) of Diesel railcars and their control trailers, if any, and of multiple-unit sets, respectively, should be arranged in such a manner that :

« (a) a good visibility is ensured ;

« (b) the travelling direction may be reversed without turning the vehicle.

« These conditions are most satisfactorily fulfilled with the driving position(s) arranged at the end of the vehicle.

« But the provision of a single driving position at a high enough level either at one of the ends or at about the centre of the railcar also ensures a satisfactory visibility, even if a trailer is running ahead of the motor unit, provided the vehicles are not excessively long.

« Where two cabs are provided, high-level positions afford greater safety to the driving staff, especially in such cases where part of the power unit is built into the car body immediately in front of the driving position at the level at which an impact with possible obstacles on the track might occur.

« Care should be taken in the design of the driving position to ensure that the driver is protected from eye strain due to the inclusion in his line of vision of the track passing directly beneath his eyes.

« The provision of a driving position at each end of the set suffices for twin or multiple-unit sets, the components of which are never used separately. »

— The meeting adjourned at 12.50.

## Meeting of the 1st October 1958.

PRESIDENT : J. RATTER.

— The meeting began at 9.30 a.m.

**The President.** — Gentlemen, since our last meeting we have made certain revisions to Summaries Nos. 7, 8, 9, 10 and 11, and I think we should begin by examining these new texts before we go on to Summary No. 14. I will therefore ask Dr. GAEBLER to be good enough to read the revised text of Summary No. 7.

**Dr.-Eng. Gaebler.** — *Summary No. 7 :*

« 7. In the design of a vehicle, particular importance should be attached to accessibility of the power equipment.

« The underfloor arrangement of the latter can be used for small to medium ratings, and provides the advantage of more space for pay load in the car body. But where it is desirable to have a low level floor (for example on secondary lines where the stations often have no platforms), space may not be available to permit such arrangement.

« The tractive power equipment of medium to high rating may be installed either in the bogie or in the car body. Installation in the bogie offers the advantage of facilitating the exchange of the entire power unit, inclusive of its bogie, but accessibility is more easily attained, even in operation, by installation in the car body.

« The protection of the power unit

against bad weather conditions, and dust as well as a more efficient noise insulation are more easily realised with the installation of the engine in the car body. »

**The President.** — Are there any points on that revised text? We covered the points which Mr. ALSTRÖM raised, that satisfies you?

**Mr. Alström.** — Yes.

**Mr. Martin** (in French). — Mr. President, Gentlemen, I asked that it should be made clear if possible exactly what was meant by « small and medium ratings », i.e. that after these words we should put, for example, in parenthesis up to 450 or 500 HP. That is my first point.

My second point concerns the sentence :

« But where it is desirable to have a low floor (for example on secondary lines where the stations often have no platforms) space may not be available to permit such arrangement. »

It seems to me that in general a low floor is a great convenience for passengers, and consequently, as regards the easy accessibility in to the body, except obviously in the case of high platforms.



Instead of this wording I would prefer the following in consequence :

« But if a low floor is desired, there may not be the necessary room. »

**The President.** — That is quite a small change; it provides for low level floors wherever they may be decided. Have you any comment Dr. GAEBLER ?

**Dr.-Eng. Gaebler** (in German). — I think this wording could also be adopted, perhaps rather more briefly, but containing the same idea in principle.

**Mr. Cuttica, Italian State Railways** (in French). — A low floor obviously is always desirable. I think it would be sufficient simply to say if it is sufficiently low for the needs of the railway.

We could complete the sentence suggested by Mr. MARTIN by adding « particularly low » because, I repeat, a low floor is always wanted. If it is particularly low, the demand is justified.

**The President.** — We will just read out the text which we hope will cover these points.

**Mr. Squilbin** reads out the proposed text taking into account the suggested modifications.

**Mr. da Cunha Monteiro** (in French). — We said :

« For low and medium ratings (up to about... »

**Mr. Squilbin** (in French). — « For low and average ratings (up to about 450 HP)... »

**Mr. Tourneur** (in French). — 500 HP.

**M. Squilbin** (in French). — We will therefore say: « up to about 500 HP)... ».

(Sign of assent from Mr. TOURNEUR.)

**The President.** — The rest is the same as previously read out; does that omit something you had in mind, Mr. ALSTRÖM ?

**Mr. Alström.** — That is all right.

**Mr. Abdel Salam, Egyptian Republic Railways.** — I think some conditions, such as dust, will affect the maintenance of the Diesel engine and that with this 500 HP Diesel engine the dust would accumulate tremendously under the floor. Our experience with such an engine in the underfloor position is that it is usually affected very badly with dust and dirt.

**The President.** — Dust gives a great deal of trouble with underfloor engines in dry conditions, where there is sand and dust.

**Mr. Abdel Salam.** — Sand and dust, then such engines get very dusty and sandy to a great extent and in our experience are a source of trouble, in fact, the use of underfloor engines is not indicated in such case.

**Dr.-Eng. Gaebler** (in German). — I think this point has been covered in the last paragraph. Is it not sufficient ?

**The President.** — Is it clear that the last paragraph shows that protection

against atmospheric influences is more easily achieved when the engine is fitted in the car body? This means therefore that it should be remembered that the protection of an engine fitted under the floor is less good, and I think that now the last paragraph of the summary meets Mr. ABDEL SALAM's wishes.

**Mr. Abdel Salam.** — I do not understand what « bad weather » contains, if the explanation of bad weather covers that...

**The President.** — If you like we could put « as well as dirt and dust » or « atmospheric influences and dust ».

**Mr. da Cunha Monteiro.** — There are no deposits without dust.

**Mr. Tourneur** (in French). — Let us say « dust » instead of deposit.

**Mr. Squilbin** (in French). — We will therefore say :

« ... atmospheric influences and *dust*... »

**Mr. Abdel Salam.** — Speaking about Diesel engines, the power is affected by the type of Diesel engine and when we leave it at 500 HP and no mention is made of the type of Diesel, it might lead to some misunderstanding. Then, I would rather with underfloor engines, it was not mentioned up to 500 HP for as we know that an engine with 2 000 revs. is about half one of 600 revs., so if we could say 500 HP for medium speed engines so that a Diesel engine is not only defined by this power

but its power, volume and weight. I think all these points should be considered.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I think we should remember in this connection that the report reflects the replies given by the Administrations consulted. And in the report it is precisely of engines of this power that mention is made.

As for the other technical details, these are certainly of interest, but they were not the subject of any questions and I think if we go into details, this is going to take us too far.

**The President.** — I think we must say that this particular paragraph deals with the accessibility of the engine for the underfloor type and/or the car body type and should not be expanded to cover the point raised by our Egyptian colleague.

**Mr. Abdel Salam.** — I speak from our experience of the power of Diesel engines which could be used underfloor, so we must make ourselves clear and say : 500 HP in the case of high speed Diesel engines.

**The President.** — Add « up to 500 HP for high speed engines », that seems to be the point.

**Dr.-Eng. Gaebler** (in German). — I see no objection to including this reference to the fact that the ratings in question, in the case of the underfloor arrangement, require higher speeds of rotation. Moreover I do not know of



any engines fitted under the floor which have very low speeds of rotation.

**The President.** — I think that your point really is covered by what has been said; it is said: engines up to 500 HP are used under the floor; and that is a fact: they are used under the floor. If we go into the details of the engine, it leads us into something which this paragraph is not meant to convey; it was discussed in the other Summaries yesterday.

**Mr. Abdel Salam.** — What I mean is that the reports of this Congress are looked upon as a reference by the designers and railways and are known throughout the world.

**Mr. Cuttica** (in French). — I see no objection to adding a few words indicating the value of the speed of the engine which can be allowed, but to appease those who may perhaps make use of engines fitted under the body; I might add that we have some engines with a rating of 500 HP and even more (700 HP) running at 1 400 or 1 500 r.p.m. so that they come into the category of high speed engines as dealt with in Summary No. 4 for example, and these give complete satisfaction. So there is no need to worry about this.

**The President.** — As a suggestion to get over these points, it is possible that this will meet the case: where we say « up to 500 HP for engines under the floor », we add « up to 500 HP in the case of *high speed engines* »; to cover the point raised by Mr. ABDEL SALAM.

**Mr. Abdel Salam.** — Yes.

**The President.** — Any other points on No. 7? I declare same adopted.

— *The text of Summary No. 7 is worded as follows:*

« 7. In the design of a vehicle, particular importance should be attached to accessibility of the power equipment.

« The underfloor arrangement of the latter can be used for small to medium ratings (up to about 500 HP with high-speed engines) and provides the advantage of more space for pay load in the car body. Where it is desirable to have a particularly low level floor, however, space may not be available to permit such arrangement.

« The tractive power equipment of medium to high rating may be installed either in the bogie or in the car body.

« Installation in the bogie offers the advantage of facilitating the exchange of the entire power unit, inclusive of its bogie, but accessibility is more easily attained, even in operation, by installation in the car body.

« The protection of the power unit against bad weather conditions, and dust as well as a more efficient noise insulation are more easily realised with the installation of the engine in the car body. »

**The President.** — We had a great deal of difficulty in re-drafting Summary No. 8 to meet a very important question which was asked by Mr. Ivanov. That is to compare in as short a way as we could the advantages of the various transmission systems. It is, of

course, a very technical question and a very difficult one to incorporate in the summary in a few short sentences. However, Dr. GAEBLER has re-written an alternative Summary No. 8 although it may be better perhaps to leave it as it was first because I know Dr. GAEBLER feels it is difficult to do justice to the subject in such a short space.

I am now going to ask Dr. GAEBLER to read out the alternative so that you can see which you would prefer. Would you kindly read out Summary No. 8.

**Dr.-Eng. Gaebler** (in German). —

« 8. The following transmission systems are in use :

« a) mechanical, hydro-mechanical or hydraulic transmissions for low power ratings. The mechanical transmission has better efficiency. Its drawback is that vehicle speed and engine speed are related in a fixed manner in each gear. Therefore, any equipment having a mechanical gear must have an efficient friction clutch which will compensate for the speed difference between engine shaft and driving shaft during the starting period.

« In more recent times, mechanical gear with hydraulic couplings ahead of them have also been frequently used for this purpose.

« b) because of increasing construction difficulties with friction clutches as power increases, mechanical gears with hydraulic converters ahead of them or hydraulic transmission are used for medium up to higher power ratings. Towards the top of the medium range, electric transmissions are in service.

« c) hydraulic or electric transmissions exclusively for high power ratings. At the present time, both systems have been giving satisfactory results in service even for higher output. They are practically equivalent as regards their efficiency.

The advantages of hydraulic transmission in the starting period have to be compared with the advantages of electric transmission as regards regulation, particularly in the part load range.

The question as to which system is to be preferred depends, apart from the operating conditions, or the availability from industry of suitable proved types for the vehicle under design. »

**Mr. Abdel Salam.** — I would like to say that there are advantages with the Diesel-hydraulic transmission but in the case of working multiple units of Diesel railcars it is so difficult to control the speed of the Diesels working together whether low powered or high, the friction clutch is also out of the question. There is a difference between wheel speed and engine speed so if we use multiple units with friction clutch we shall have the wheel speed and the engine speed both operating. With our experience we say for small power when it is intended to use the Diesel railcar singly but never in multiple units even for 100 HP hydro-mechanical or electric, with the exclusion of hydraulic-mechanical.

**Mr. Tourneur** (in French). — M. President, personally, I am not completely in agreement with the suggestion that has just been made.



In fact, we have a lot of railcars in service with mechanical transmissions, and at the present time it is perfectly possible to assure satisfactory synchronisation of the clutches.

Consequently, as far as I am concerned, I state my agreement with the text suggested by the *Special Reporter*.

I might even add that I also was in agreement with the much briefer text originally suggested.

**Mr. Stagni** (in French). — I quite agree with Mr. TOURNEUR. In Italy, we normally have cases of four clutches being controlled by a single driver, and this has never given rise to the slightest trouble.

I would also agree in saying that it is not necessary to define too exactly the delimitations between the drawbacks of the different types of transmission.

Here is an example: in Italy, on the secondary lines in Sardinia, we have 300 HP railcars which were supplied in two series, one with mechanical transmission, the other with electric transmission, with the same type of engine and body.

What may surprise you perhaps is that they cost the same. (*Laughter.*) I am not sure if the costs were the same, but the purchase price certainly was.

This is a typical example, but it makes one doubt whether it is possible to define the limits of the different systems of transmission so definitely.

That is why I would agree to the first text which is less precise.

**The President** (in French). — Because it is of a very general nature.

**Mr. Abdel Salam.** — That was not what I said; we also have railcars with mechanical transmission, but they have only been in service a relatively short time. For example, we have a 350 HP Diesel-mechanical railcar; we also have an 408 HP one that has been in service since 1947, and railcars have been running as multiple units in Egypt since 1934; the engines have a sufficiently long life, but the life of the friction clutch itself is not satisfactory. In my opinion, the precision synchronisation of the engine is much to be preferred to the hydraulic or electric system. Modern technique allows of different speeds for the engines.

**Mr. Martin** (in French). — Mr. President, yesterday we discussed this point for an hour.

Today, Mr. ABDEL SALAM comes along with some new information. If we continued these discussions tomorrow, it is very likely that we should get some more, brought along by some other Delegates.

This proves, in my opinion, that the question of the transmission — as several representatives pointed out yesterday — is a big enough subject to have a whole congress to itself; that it should be dealt with not only for railcars but also for locomotives, and that the problem should be examined at one and the same time under all its aspects, cost, weight, maintenance troubles, possibility of running as multiple units, etc.

Consequently, I suggest very definitely that we should retain the text suggested by the Reporter without adding anything at all to it.

**Mr. Ivanov** (in Russian). — I prefer the second wording and it is very desirable to receive the opinion of such a powerful organisation as the Congress concerning the data of the different types of transmissions. Taking into consideration the difficulties which are clear at the meeting, it is very difficult to discuss this question here in this session. I prefer the second modified wording of this Summary No. 8, it gives a better idea about the different types of transmissions.

**The President.** — If the second text be adopted, are there any objections to the second text? I think I may say as Chairman that we cannot spend much more time on this matter, we have other texts to consider and we must finish the examination of Question 3 today. It is, of course, possible to extend the text considerably but we cannot do it now. Mr. MARTIN prefers the first text, Mr. IVANOV the second text; but, Mr. MARTIN, I think the general feeling is that the second text is equally acceptable though a little longer.

**Mr. Martin** (in French). — Yes, I will agree to the second text if the Delegates as a whole prefer this to the first.

**Mr. Alström.** — On the other hand, I have observed that the two texts, French and English, are not quite similar, in the English text it says the following transmission systems are suitable, but in the French text it is stated the systems of transmissions are utilised, I think it should stand in the English text as in the French.

**The President.** — Subject to that, may I approve this text? Any other points that anyone would like to raise? I declare it adopted.

I call upon Dr. GAEBLER to read out the revised Summary No. 9.

**Dr.-Eng. Gaebler.** — *New Summary No. 9:*

« The position of the power unit (Diesel engine with its transmission) in the railcar is influenced by :

« (a) type and location of the Diesel engine, and

« (b) choice of transmission system.

« Both the mechanical and hydraulic transmissions require a more restricted layout of engine, transmission, and driving axles.

« The electric transmission, on the other hand, allows greater freedom in the arrangement of the power unit with its generator and the axle drives (traction motors).

**The President.** — The only difference here is that in the fourth paragraph it says: « ... gives a more *compact* layout... » instead of « more restrictions in the layout of the engine... ». I think the word *compact* is better in the English text. As for the question raised yesterday by Mr. ALSTRÖM, we have tried to include this in the previous summary.

**Mr. Tournour.** — Mr. President, for my part, I find the original text much clearer, because the fact of stating that



the installation is more compact is almost an advantage.

On the contrary, the fact of having a non-electric transmission involves installation difficulties. This is what the first text showed.

Consequently, for my part, I much prefer the first text.

**Dr.-Eng. Gaebler.** — I agree.

**The President.** — The same sense is there. We will keep the *first text* as you prefer it. Are there any other points on that? I declare the *first text approved*. Now we can pass to Summary No. 10.

**Dr.-Eng. Gaebler.** — *Summary No. 10:*

« In order to ensure the proper functioning of the power unit in operation and to enable suitable measures to be taken in the event of a breakdown in service, the installation of suitable supervisory instruments to be watched by the driver or of automatic control apparatus is to be recommended, covering, for instance, the engine coolant temperature, engine coolant reserve, oil pressure and oil temperature.

« Any automatic supervisory equipment should function on the « fail to safety » principle in order to ensure that in case of any failure the equipment under supervision will be switched off. Indicator lamps locating failures should be provided, not on the driver's panel, but in the neighbourhood of the machinery to which they refer.

« Automatic control has the advantage that it:

« a) is continuous so that it becomes immediately operative in case of failure, and

« b) leaves the driver free for the performance of his other duties as they relate to train operation, etc.

« Its drawback is a somewhat higher expenditure for first cost and maintenance.

« Traction power installations of high rating, which are necessarily expensive, warrant the installation of automatic control apparatus.

« Alarm apparatus or indicators of a more simple design should prove adequate for less costly power equipment operating under less exacting conditions.

« In the case of automatic control, the indicators provided on the driver's panel should be kept to a minimum, and so far as possible, should consist only of those indicators required to assist him in the operation of the train. A single warning indicator may be provided to cover failure of the power equipment. »

**The President.** — Any points arising from that? We tried to take the particular point you raised about the driver's instruments, Mr. MAASS.

**Mr. Maass.** — One point in the French translation, I mentioned three instruments, speedometer, brake instruments and tachometer, but you only mention the tachometer in the French text, I am not quite sure of the French text.

**The President.** — We will make the French and English texts agree, of course.

**Mr. Martin** (in French). — Mr. President, to answer the comment just made, I think that we might simplify the last paragraph; if we make it clear to start with that this last paragraph applies to old equipments with automatic controls, and simply say :

« In the case of automatic control, the indicating instruments on the driver's desk should be reduced to the minimum and only include as far as possible those actually required for the driving of the train. »

Then add :

« A single warning device could be installed to signal any damage to the power equipment. »

Without specifying speedometers.

I do not think it is up to us to define exactly what instruments there should be on the driver's desk; this is more the job of a committee of the U.I.C.

**The President.** — Mr. MAASS, unless you object, you spoke of two instruments, not three.

**Mr. Maass.** — At least two, the brake instruments and the speedometer.

**The President.** — That also brings out the point of automatic supervisory equipment we were discussing just now.

**Dr.-Eng. Gaebler.** — I would agree to the proposal of Mr. MARTIN.

**The President.** — Would Mr. MARTIN have any objection if we said in the case of automatic control the indicators on the driver's panel should be kept to a minimum, and so far as possible, should consist only of those indicators required to assist him in the operation of the train. Add the words such as « speedometer and brake indicator » to cover Mr. MAASS' point.

**Mr. Martin** (in French). — What apparatus ?

**Mr. Squilbin** (in French). — Speed indicator and brake control.

**Dr.-Eng. Gaebler.** — No.

**Mr. Martin** (in French). — Speedometer, certainly. I do not think any motor unit runs without a speedometer.

**Mr. Tourneur** (in French). — With multiple units there are no speedometer indications; it is therefore possible to do without a speedometer.

**Mr. Martin** (in French). — It is necessary to see the speed of the motor.

**Mr. Tourneur** (in French). — The speed of the engine.

**Mr. Martin** (in French). — Every engine has one. It is useless to say so. And there is always a brake handle, etc.

**Mr. Squilbin** (in French). — That is obvious.



**Mr. Martin** (in French). — On the contrary, when running in multiple units, there is generally no indication of the speed of all the engines of the rake.

**Mr. Boulanger** (in French). — I quite agree with Mr. MARTIN; Summary No. 10 is dealing with the control of the power equipment and not with the apparatus needed for the running of the train, such as brakes, speed indicators, etc.

It would be better I think not to mention any instruments in this summary.

**The President.** — Not the driver's instruments? To get over this difficulty would you mind if we left it simply to say the indicator and say only those indicators required to assist the driver in the operation of the train and not specify any particular instruments?

The point Mr. BOULANGER makes is that really we are not dealing with all of the driver's gear and it seems Mr. MAASS that your remark is apparently covered if we say that the equipment is restricted to the instruments the driver needs.

**Mr. Maass.** — This clause only deals with the power unit as such and not the driver's operations.

**The President.** — The clause is for supervisory equipment and we get the idea if you say we keep the indicators to the minimum and only those that the driver must have.

**Mr. Maass.** — I agree.

**Mr. Alström.** — The control system is defined in the new French text, but I am not sure with the English text on the « fail to safety » system. I do not know, I have not seen this wording before; it is a question of a control system based on a non-interrupted current and I do not know if Mr. SYKES could say if this is the right wording « failure to safety » system. Do you know what that means, Mr. SYKES?

**Mr. Sykes, British Railways.** — It is not easy for me to answer Mr. ALSTRÖM without knowing the French text. The « fail to safety » system is one in which a « clear indication » is only maintained so long as the current is flowing; any interruption of the current would immediately produce the indication required.

**Mr. Tourneur** (in French). — There are no lamps; it is automatic control.  
(*Sign of assent from Mr. ALSTRÖM.*)

**The President.** — I think we have Summary No. 10 adopted as written subject to an alteration in the last paragraph which I will ask to be read out so that we can be quite sure we are perfectly agreed.

**Mr. Squilbin** (in French). — Taking into account the comments made, the last paragraph of Summary No. 10 will become :

« In the case of automatic control, the indicators provided on the driver's panel should be kept to a minimum, and so far as possible, should consist only of those indicators required to assist him in the

operation of the train. A single warning indicator must be provided to cover failure of the power equipment. »

**Mr. Boulanger** (in French).— « ... can be installed... »

**Mr. Squilbin** (in French). — We will therefore say :

« A single warning device may be provided to cover failure of the power equipment. »

**The President.** — No other objections ? I therefore declare Summary No. 10 adopted and we now come to the last altered text, that of Summary No. 11.

— *The new text adopted for Summary No. 10 is as follows :*

« 10. In order to ensure the proper functioning of the power unit in operation and to enable suitable measures to be taken in the event of a breakdown in service, the installation of suitable supervisory instruments to be watched by the driver or of automatic control apparatus is to be recommended, covering for instance, the engine coolant temperature, engine coolant reserve, oil pressure and oil temperature.

« Any automatic supervisory equipment should function on the « fail to safety » principle in order to ensure that in case of any failure the equipment under supervision will be switched off. Indicator lamps locating failures should be provided, not on the driver's panel, but in the neighbourhood of the machinery to which they refer.

« Automatic control has the advantage that it :

« (a) is continuous so that it becomes immediately operative in case of failure, and

« (b) leaves the driver free for the performance of his other duties as they relate to train operation, etc.

« Its drawback is a somewhat higher expenditure for first cost and maintenance.

« Traction power installations of high rating, which are necessarily expensive, warrant the installation of automatic control apparatus.

« Alarm apparatus or indicators of a more simple design should prove adequate for less costly power equipment operating under less exacting conditions.

« In the case of automatic control, the indicators provided on the driver's panel should be kept to a minimum, and so far as possible, should consist only of those indicators required to assist him in the operation of the train. A single warning indicator may be provided to cover failure of the power equipment. »

**Dr.-Eng. Gaebler.**— *Summary No. 11 :*

« 11. Water cooling of engine has been of general practice up to the present. It is known that air cooling has been used in a limited number of cases in the lower power engines.

« Water-cooled Diesel engines make protective measures of the cooling system advisable against :

« (a) corrosion and erosion;

« (b) scale formation and incrustation;

« (c) freezing during the cold season. »



**The President.** — Are there any comments ?

**Mr. Tourneur** (in French). — Mr. President, for the sake of information, I should like to know whether there are any railcars, even of low power, fitted with air cooled engines.

**Mr. Boulanger** (in French). — In reply to the question asked by Mr. TOURNEUR, I can report that the Luxemburg Railways — I do not think they have any representative here — have ten double railcars each with two 220 HP Deutz air cooled engines.

These railcars have been in service for nearly two years.

**Mr. Abdel Salam.** — We have two small Diesel units working, the power is 125 HP and they have been in operation for the last three years. There have been no complaints from the point of view of cooling. We are thinking of building Diesel engines of bigger horsepower to work on the Diesel locomotives with air cooling.

**Mr. Alström.** — In Sweden, we have had some railcars with air-cooled engines for about the last two years ago, I am not sure, but I think of about 400 HP i.e. two motors of 200 HP each.

**The President.** — Dr. GAEBLER. Would you like to say something ?

**Dr.-Eng. Gaebler** (in German). — I can only add that in Germany also there are railcars with air cooled engines in operation on certain private railways.

**The President.** — That I think, answers the question. Any other comments on the text as read out ? I declare *the revised text of Summary No. 11 adopted*. We now come to Summary No. 14.

**Dr.-Eng. Gaebler.** — *Summary No. 14:*

14. In railcars used under simplified conditions, with a single power unit and not required to run jointly with a control trailer or other motor units, direct mechanical control of the power unit and its auxiliary is possible and adequate. This type of control is reliable and economical to purchase and maintain, because of its simple construction.

On the other hand, railcars to be used jointly with a control trailer or other motor units should be equipped with remote control, unless the cost of the staff needed to attend two or more power units represents a smaller money outlay than the building, operation, and maintenance of multiple control equipment.

In designing for a strictly limited combination of power units, a relatively simple and inexpensive multiple control may be provided.

When the traffic requirements involve the use of a larger number of power units, operated together by a single driver, a multiple control system in conjunction with fully automatic control of power units, as described in item 10, is necessary.

**Mr. Maass.** — One point arises : what is meant in the opening sentence by « ... in railcars used under simplified conditions »; what is being simplified ? I feel it could be omitted altogether.

**Dr.-Eng. Gaebler** (in German). — « Simplified conditions » implies operating conditions such as exist on secondary lines with rather low requirements as to operating and seating capacity of railcars used.

**The President.** — Would you like to see it put in any other way?

**Mr. Maass.** — That little phrase raises a question in one's mind. Railcars working under single unit power operation does not mean where they operate; that is a secondary issue altogether.

**The President.** — Would you feel that by deleting the words « under simplified conditions » the sense would be lost?

**Dr.-Eng. Gaebler** (in German). — I have no objection to the amendment proposed by Mr. MAASS.

**Mr. Alström.** — It is the principle of the question regarding this summary and that is the question of possible designs. At least in our country, we like to standardise to the largest degree; we do not like to have one railcar for one single area, it should be usable for all the system and standardised to a large extent and we are ready to take a little more first-cost against the gain of standardisation. We have put in operation several types of railcars with the single railcar having the same combination of power units and ultimately the large and powerful units. I ask myself if it should not be put under this point the question of standardisation.

**The President.** — I think it is clear to say that the very first summary and therefore the most important point is to emphasise the necessity to standardise, and in Summary No. 2, there was a reference to the need of standardisation

of the more important components but perhaps Dr. GAEBLER would like to say something about that.

**Dr.-Eng. Gaebler** (in German). — You have already called attention to the fact that the advantages of standardisation have been included in Summary No. 2. I can but recognise the justness of Mr. ALSTRÖM'S opinion, but I think that we cannot re-open the matter by introducing it in this text, which has been deliberately worded in general terms in view of the fact that the methods of control are in full evolution.

If Mr. ALSTRÖM agrees, we might include his remark in the minutes, without taking it into account in the text of the summary.

**Mr. Alström.** — I agree.

**Mr. Squilbin** (in French). — I would remind you that the discussions are reproduced « in extenso » in the *Bulletin* of the Association; all the remarks made will be published there.

**Mr. Boulanger** (in French). — I would like certain clarifications in the third paragraph:

It is said:

« When designing for a strictly limited combination of power units, a relatively simple and inexpensive multiple control may be provided. »

Is this to be taken as referring to power equipment mounted on the same unit or mounted on different units?

In the latter case, it is necessary, I think, to have automatic control of the



power equipments, as in the case mentioned in the fourth paragraph.

**The President.** — Would you like to suggest a way of covering that point Dr. GAEBLER?

**Dr.-Eng. Gaebler** (in German). — To answer Mr. BOULANGER's question, this paragraph means that in the case of a limited number of power equipments, simple multiple control can be recommended; the devices required for this simple multiple control should exist in each power equipment to be controlled as well as those which are operated by the driver. They must, of course, be in each driving compartment.

Was this what meant Mr. BOULANGER?

**Mr. Boulanger** (in French). — If the power equipments are mounted on two different vehicles, if two railcars have to be coupled together, there must be similar automatic controls to those mentioned in paragraph 4.

**Dr.-Eng. Gaebler** (in German). — Supervisory instruments.

**Mr. Boulanger** (in French). — Control instruments. We are getting back to the last paragraph.

**Dr.-Eng. Gaebler** (in German). — I think this is a question of the terminology. In fact, where you say multiple control in English or French, in German we talk of *simple multiple control* and *complex multiple control*. I

do not know how to express myself. It is a subtlety of the language.

*Complex multiple control* is the standard system of remote control of multiple unit rakes. This presupposes thorough automatic supervision of the power equipments, as previously described.

This system is characterised by the very numerous functions it has to ensure and is consequently relatively costly. It includes, for instance, equipment to allow of cutting out or putting into service whilst running different isolated engines of the train set.

I am merely saying this to give you an example.

On the other hand, for simpler operating conditions, *simplified multiple control* will be sufficient with which it is not possible to cut out or put back into service different engines of train set from the driving compartment, and which, in addition, does not include automatic supervision of all operating functions of the engines. This is sufficient for low rated power equipments and costs less.

These are the differences between the two multiple control systems: complex multiple control and simple multiple control.

**Mr. Collins.** — I think that these two paragraphs are not sufficiently precise unless we describe the type of control systems; simple control system in paragraph 3 and the complex control system in paragraph 4 and unless we say what we mean by the phrase « a strictly limited » in paragraph 3 and a « larger number » in paragraph 4. I

wish these two paragraphs be deleted unless we give a more precise explanation as given by Dr. GAEBLER.

**Mr. da Cunha Monteiro** (in French). — I do not think we should mix multiple control and checking.

In effect, as previously stated, we are endeavouring more and more to concentrate all the control equipment in the engine compartment. It is possible to start up the engines not from the driving compartment but from the engine compartment.

We should only mention a single method of multiple control and not complex or simple multiple control. It is solely for the designers and railways to decide whether more or fewer instruments shall be used for multiple control.

**The President.** — Dr. GAEBLER would you like say something?

**Dr.-Eng. Gaebler** (in German). — I am agreeable to the suggestion of Mr. DA CUNHA MONTEIRO since the explanation of the various engineering differences between such system is out of the scope of this conclusion and would lead us too far.

**The President.** — In that case how would you propose to cover the text? There was a proposal to delete the two sentences which have caused this discussion.

**Dr.-Eng. Gaebler** (in German). — Perhaps, delete the third paragraph.

**Mr. da Cunha Monteiro** (in French). — No, the last two paragraphs.

**Dr.-Eng. Gaebler** (in German). — The fourth paragraph merely explains the difference between remote control and supervision. I think it might be retained?

**Mr. Squilbin** (in French). — In the last paragraph, we might say: « When traffic requirements make it necessary to use a large number of power equipments... ».

**Mr. da Cunha Monteiro** (in French). — « ... a *certain* number... »

**Mr. Squilbin** (in French). — « ... a certain number... »

**Mr. Boulanger** (in French). — According to the explanations given by Dr. GAEBLER, paragraph 3 likewise only applies to low power ratings. The new 4th paragraph should therefore also apply to the case of tow units only but with a high power rating.

**Mr. Squilbin** (in French). — « ... of a certain number... » without stating how many.

**Mr. Boulanger** (in French). — Yes, but the question of power also comes into it, since I understood that simplified multiple control only applied to a limited number of power equipments and to small equipments with a low power rating.

**Dr.-Eng. Gaebler** (in German). — What should we say, Mr. BOULANGER, to express exactly what you mean?



**Mr. Tourneur** (in French).— Mr. President, we have only two words in French to distinguish between the two systems of control: double unit control and multiple unit control.

Double unit control applies to cases when there are only two power equipments, which can be on two different vehicles or on one, which then makes it possible to simplify the installations very considerably, as the Reporter has mentioned.

I therefore suggest we keep the two paragraphs modified as follows:

« When a strictly limited combination of power equipments is considered (running in double units for example) a relatively simple and inexpensive multiple control can be provided. »

And for the second paragraph:

« When traffic requirements make it necessary the use of a greater number... », etc.

We can leave the text.

**The President.** — I hope this will satisfy you, Mr. COLLINS?

**Mr. Collins.** — Yes.

**The President.** — Any other point on the whole of Summary No. 14?

**Mr. Alström.** — I am sorry to say some words about the last part of this summary. As Dr. GAEBLER has explained the different systems of the multiple unit control, the complex and simple one, and that he said that when the traffic requirements involve the use of larger power units a single fully auto-

matic control power unit as described in Summary No. 10 is necessary, I would like to point out as regards the word « fully »: we are driving up to ten power units without having the fully automatic control of the power units, we cannot start or stop from the driver's cab. The second word should be « supervision » then it is all right.

**The President.** — The proposal is to change the word « control » to « supervision », « fully automatic supervision ». Any other points on Summary No. 14? I declare that adopted.

**Mr. Squilbin** (in French). — The French text will not be altered, simply the English text.

— *The text adopted for Summary No. 14 is the following:*

« 14. In railcars used under simplified conditions, with a single power unit and not required to run jointly with a control trailer or other motor units, direct mechanical control of the power unit and its auxiliary is possible and adequate. This type of control is reliable and economical to purchase and maintain, because of its simple construction.

« On the other hand, railcars to be used jointly with a control trailer or other motor units should be equipped with remote control, unless the cost of the staff needed to attend two or more power units represents a smaller money outlay than the building, operation and maintenance of multiple control equipment.

« In designing for a strictly limited combination of power units e.g. a twin

unit, a relatively simple and inexpensive multiple control may be provided.

« When the traffic requirements involve the use of a larger number of power units, operated together by a single driver, a multiple control system in conjunction with fully automatic supervision of power units, as described in item 10, is necessary. »

**Dr.-Eng. Gaebler.** — *Summary No. 15:*

15. One of the determining factors of economic operation of Diesel railcars is the structural weight, as it influences:

- (a) the determination of required power output;
- (b) the fuel consumption;
- (c) the extent of wear and tear (in particular of the running gear components and brakes), and consequently, the extent of repair costs;
- (d) the purchase price.

This makes it advisable to limit the weight to an economically tolerable minimum value.

Efforts to effect weight savings should extend to all components of the railcars and their trailers and control trailers, wherever this can be achieved without impairing the safety of passengers, reducing travelling comfort to any noticeable extent or incurring liability of heavy maintenance and renewal costs.

A reasonable additional charge incurred by increased expenditures for design and materials as a consequence of an intensified light-weight construction may be tolerated to a certain extent, in view of the expected savings.

Construction methods recommended to effect weight savings are:

- (a) light-weight construction in steel with extensive welding;
- (b) combined steel and light alloy construction;
- (c) application of light metals and their alloys and plastics;
- (d) utilization of light-weight mechanical equipment and other fittings.

**Mr. Koster, Netherlands Railways.** — Mr. Chairman, referring to paragraphs 2 and 3 of Summary No. 15, I should like to suggest that safety of passengers is mentioned in the first place, and in addition, I should like to suggest that the word « repairs » should be replaced by « maintenance ».

**The President.** — Where had you in mind, putting the question of the safety of passengers first?

**Mr. Koster.** — I am referring to the second paragraph of Summary No. 15, which I should like to read: « without endangering the safety of the passengers, the efforts to limit the weight... », etc.

**The President.** — Would you like to say anything on this point, Dr. GAEBLER? Would you put those words at the head of the paragraph and just read on? I think the point can be resolved in two ways in paragraph c). If we change the word « repair » to « maintenance », then change the word « maintenance » to « repair » in the paragraph at the bottom of the page, which would then commence with the words « Without impairing the safety of passengers, efforts to effect weight saving », etc., etc.

**Dr.-Eng. Gaebler.** — I think we can agree.

**Mr. Squilbin (in French).** — In French, the text of the paragraph: « Efforts to effect weight savings... » will therefore begin by insisting on the safety of the passengers. There will there be an inversion of the text.

**Mr. Abdel Salam.** — Regarding light weight construction, I should like to add the design on the coaching side, I mean that the underframe of the coach takes the load, and lighter construction, light metals and light weight design, applying the tube method of design for the coaching side.

**The President.** — Dr. GAEBLER, could you add a word to cover that point?

**Dr.-Eng. Gaebler** (in German). — I see no objection to adding a remark to this effect. We could add a new paragraph *a*) saying, for example: « *a*) use of tubular methods of construction » and the present *a*) would then become *b*).

**The President.** — Mr. ABDEL SALAM, do you agree?

**Mr. Abdel Salam.** — Yes.

**Mr. Athanassov, Ministry of Transport and Communications, Bulgaria** (in French). — Mr. President, if you will permit me, I should like to:

1) call your attention to the following sentence:

« it is therefore recommended to limit the weight to the minimum value economically acceptable » and to ask you first of all to put this sentence at the end of the paragraph and then replace the word « weight » by the « power-weight ratio » which would be clearer;

2) ask Mr. GAEBLER a question in connection with the remark made by

Mr. KOSTER regarding the meaning of the expression « the safety of the users »;

3) after point *d*) concerning the saving in weight, I suggest adding: *e*) use of a new method of suspension. »

By this, I am referring to a new method of suspension by compressed air which makes it possible to reduce the weight of the bogie.

**The President.** — Would you like to speak on that Dr. GAEBLER? The point is I think we are to deal with weight and not power/weight rail ratio and to change that in the way asked for would create difficulties with the whole of the paragraph but I do not know, you may think otherwise. I believe the point is really covered in the first few words.

**Dr.-Eng. Gaebler** (in German). — The remarks made are very interesting but, nevertheless, I should be of the opinion that it would not be good to include such designation in the text as this might give rise to misunderstanding that for a given power rating a weight as low as possible should be aimed at by light weight construction and the horsepower to weight ratio will be followed by the result of this work.

**The President.** — With that explanation will you accept the existing text? (Mr. ATHANASSOV *nodded assent*.) Thank you very much. The other point was that the third paragraph should go to the end of the summary as a sort of final paragraph, I think it would be all right, subject to the amendment made by Mr. DA CUNHA MONTEIRO.



**Dr.-Eng. Gaebler.** — I think it could be agreed.

**The President.** — Thank you. Any more comments?

**Mr. Collins.** — I suggest that paragraph 2: « This makes it advisable » should be altered to read: « It is advisable »; cancelling point *d*) relative to the fact of increasing the purchase price, as I am of the opinion that this paragraph is misleading.

**Mr. Cuttica** (in French). — I think that the sentence concerning the purchase price refers not merely to the construction of the body but to all the equipment.

From my point of view, it is necessary to retain *d*) to complete the factors influenced by the weight of the construction which comes into the profitability.

The second mention of the cost refers to the construction of the body, which is only one part of the whole.

**The President.** — I think I can see a way to get over this. If we delete point *d*) and then keep: « This makes it advisable... economically tolerable minimum value », that includes the question of the purchase price.

**Mr. Stagni** (in French). — The cost price is the fundamental thing, so why minimise it?

**Dr.-Eng. Gaebler** (in German). — Perhaps, it would be advisable to con-

sider these points *a*) to *d*) as being only a brief enumeration which should be considered in its relationship with the very first sentence and, insofar, I am inclined to say Mr. CUTTICA is right; indeed if point *d*) would be deleted, then it would alter the text of the whole first sentence. Of course, it is not a question of principle but only wording.

**The President.** — Dr. GAEBLER, you would like to keep *d*) and say: « It is advisable » instead of: « This makes it advisable ». Would you agree if it is said that way Mr. CUTTICA? (*Nod of assent.*)

**Mr. Squilbin** (in French). — In the French text, we will retain points *a*), *b*), *c*) and *d*) in the preliminary enumeration, and the following sentence will read:

« Il est recommandé de limiter le poids sans compromettre la sécurité des usagers... »,  
as Mr. KOSTER requested.

**The President.** — We may now consider Summary No. 15 as agreed, with the alterations requested.

— *The text adopted is as follows:*

« 15. One of the determining factors of economic operation of Diesel railcars is the structural weight, as it influences:

« (*a*) the determination of required power output;

« (*b*) the fuel consumption;

« (*c*) the extent of wear and tear (in particular of the running gear components and brakes), and consequently, the extent of maintenance costs.

« (d) the purchase price.

« It is advisable to limit the weight — without impairing the safety of passengers, reducing travelling comfort to any noticeable extent or incurring liability of heavy maintenance and renewal costs — to an economically tolerable minimum value.

« Efforts to effect weight savings should extend to all components of the railcars and their trailers and control trailers.

« A reasonable additional charge incurred by increased expenditure for design and materials as a consequence of an intensified lightweight construction may be tolerated to a certain extent, in view of the expected savings.

« Construction methods recommended to effect weight savings are :

« (a) use of cellular or tubular methods of construction;

« (b) light-weight construction in steel with extensive welding;

« (c) combined steel and light alloy construction;

« (d) application of light metals and their alloys and plastics;

« (e) utilization of light-weight mechanical equipment and other fittings;

« (f) use of new types of suspension. »

**Dr.-Eng. Gaebler.** — *Summary No. 16:*

16. At the designing stage of Diesel railcars, the following measures suitable to enhance travelling comfort should receive careful attention :

(a) *Insulation against noise and vibrations* involving, so far as the car body is concerned :

- prevention of drumming;
- absorption of noise;
- insulation against noise including the avoidance of openings admitting noise in the car body. When openings are un-

avoidable, they should be carefully sealed to prevent noise from reaching passenger accommodation;

and relating to the engine and its auxiliaries :

- insulation against noise and vibrations produced by the traction power equipment.

A certain increase of the weight of the vehicle caused by insulation requirements is justified.

(b) *Heating.* — The following systems may be recommended for the heating of railcars, trailers, and control trailers :

- hot air heating;
- hot water heating;
- steam heating;
- electric heating.

Where a hot air or hot water heating system is used in the railcar itself, it is advisable, for the sake of power economy, to make use of the waste heat of the engine coolant. The additional insertion of a heat generator in the heating circuit is to be recommended, permitting pre-heating of the engine coolant and passenger accommodation before going on duty; these systems also allow keeping both the engine and passenger accommodation warm, if there are operating interruptions of long duration.

Steam heating systems should be applied only if railcars are to be operated jointly with standard passenger carriages equipped with steam heating.

The additional expense of electric heating is supportable where Diesel-sets are required with a high standard of comfort.

Heating systems which make direct use of the heat of waste gases, cannot be recommended for the disadvantages inherent in such systems.

It is especially important that the heating system used provides for a satisfactory regulation of heat and is quickly responsive to regulator settings.

(c) *Ventilation.* — The ventilation of railcars used under ordinary conditions should be effected by opening windows and the provision of static suction ventilators on the roof; for services with a higher standard of comfort, the installation of electric fans may be envisaged.

Hot air heating systems should be designed in combination with the ventilation of the car interior.

It is self-evident that, except for countries with an unusually hot climate and subject to dust conditions, and apart from vehicles offering a rather high standard of comfort, the provision of an air-conditioning plant is prohibitive on account of its high cost and additional weight. Where such an installation is included, it is recommended that it should have its energy supply provided by a separate generator, driven by an auxiliary Diesel engine.

(d) *Gangways*. — If the kind of service provided supports the additional expenditure, it is advisable to provide gangways for the passengers between the individual railcars in a set, designed as :

- gangway floor plates, normally for the use of railway staff only;
- gangways with bellows of various designs as a protection for passengers against weather conditions and for safety and other reasons where a certain degree of comfort applies to the vehicles.

(e) *Running gear*. — The running gear should be designed to ensure an optimum of riding stability, even with an average state of maintenance of the permanent way.

With the exception of the most simple designs, bogies should be used in the running gear.

As a additional means to improve riding stability, one or more of the following devices should receive careful attention :

- coil springs or torsion bars, practically without self-damping, for the secondary and primary suspension, together with hydraulic shock-absorbers; special care must be taken to counterbalance the natural frequency of vibration of the various suspension systems;
- self-damping springs of rubber or combined designs of steel and rubber;
- guide bars between axle-boxes and bogie frames, instead of the ordinary axle-boxes sliding in the horn guides, to eliminate the play in the longitudinal and transverse axes and to avoid wear and tear;
- locating the bogie pivot at the lowest practicable level.

Air spring systems, as well as any other design of springs with a gas or vapour chamber, have thus far seen little use in the design of railway vehicles, so that experience with this type of suspension is still lacking. However, it may be opportune to study the applicability of such systems, especially in view of the fact that the tendency is unmistakably in the direction of light-weight construction. With this type of construction, the value of the inherent possibility of these systems to ensure an automatic adaptation of characteristics to widely fluctuating loading conditions is obvious. These new systems may show the way towards genuine improvements; several experimental vehicles are already in use.

**Mr. Abdel Salam.** — In this summary, it is question of the noise and vibrations. I suggest we also add the question of safety against fire. This question has not been dealt with at all. And it is an essential point in the design of Diesel trains, of the exhaust and the fuel installations, particularly in the case of long distance trains. We have had some experience of trains catching fire, and this point is not covered at all.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I think that the mention Mr. ABDEL SALAM requires is in fact very important. I must point out, however, that this is not the right place for it, here in this paragraph since it would not fall in with the first introductory sentence which deals solely with factors which influence the comfort of the passengers.

That is why, I should make a rather special point of fire precaution.

**The President.** — Would you propose a sentence at the end on fire precaution ?



**Dr.-Eng. Gaebler** (in German). — Indeed I can agree to insert a special summary but perhaps it would be sufficient to give reference to the fact that when designing such vehicles fire safety should be borne in mind without going into engineering details.

**Mr. Abdel Salam.** — Safety from fire is not a detail of design. It is design. I see this report has covered the whole of design from A-Z. I think you should have completed it as fire precautions are the most important for the safety of the passengers and I think it must be taken into the designing of a train and to make the report complete I should very much like to see it included.

**The President.** — I would like to say two things on this question: protection against fire is of the greatest importance for all railway vehicles and not only the vehicles we are considering. The other point is it would be quite impossible at this stage to put in a large paragraph on fire protection because I think Dr. GAEBLER would agree that the matter was not included in the questionnaire.

**Mr. Abdel Salam.** — I agree.

**The President.** — Dr. GAEBLER, do you agree?

**Dr.-Eng. Gaebler.** — I agree.

**Mr. Abdel Salam.** — I quite agree that fire is serious on all railway stock but up to the present the fuel was far away from the passengers and different

from the Diesel oil; now, the fuel will be just beneath the passengers if we have underfloor engines and with engines working at very high temperatures there will always be the danger of fire, then it is different from ordinary railway experience. Second point: I agree that it is not only for Diesels but to have the matter complete there is nothing against the question to be covered and also to have a complete survey of the design of a Diesel train.

**Dr.-Eng. Gaebler** (in German). — Mr. President, Gentlemen, I must inform you that this point has not been dealt with in the questionnaire because it had not been contained in the whole scope of this question as devised by the International Railway Congress Association; but if the Assembly wishes so, and although this point has not been included in the questionnaire, I shall be glad to work out a practical enumeration of the chief points to be considered as fire precaution.

However, I wonder — as it is a question of principle — if this really can be done within the framework of our organisation.

**Mr. Tourneur** (in French). — Mr. President, I think that it is materially impossible in the time available to write any article that would be at all complete.

On the other hand, I quite agree with the importance of the question.

I therefore suggest adding a Summary No. 18 which might be worded as follows:

« Protection against fire is an important factor in the safety of the passengers and the safeguarding of the stock.

« The effectiveness of the precautions to be taken for this purpose resides essentially in the arrangements adopted when designing the stock. »

**The President.** — Would that meet your point, Mr. ABDEL SALAM ?

**Mr. Abdel Salam.** — It is not possible to discuss it at the moment, I agree with Mr. TOURNEUR. I wonder if this can be discussed at a future session. We have tried different measures to overcome this difficulty, but to my knowledge, up to now, this question has not been satisfactorily overcome by designers and manufacturers. In my opinion, however, as Diesel service is more and more extended, it must be dealt with. It costs a lot of losses and we ourselves have suffered a lot. We are in a hot country and have considerable losses by fire.

**Mr. Alström.** — I ask myself if it would not be possible in Summary No. 15 to put in some words about this question. For example, say in the question of weight saving, we compare the safety of passengers as regards collision, derailments, fires, etc.

**The President.** — This summary has been adopted. I prefer to put a short sentence at the end to cover the point, rather than to include it into another paragraph.

**Mr. Alström.** — I can agree with Mr. TOURNEUR's proposal.

**The President.** — It would be better to make it a special point, as the matter was not included in the questionnaire.

**Mr. Martin** (in French). — I agree, Mr. President, but my opinion concerning the way in which the problem of protection against fire has been dealt with up to the present is less pessimistic than the opinion just expressed. Unquestionably, great progress has been made both by the Railway Administrations and by the builders. I do not say that we are now fully protected from any accidents, but I do think, however, that we offer to the passengers vehicles which give them a very high degree of safety against any risk of fire.

**The President.** — Subject to the agreed addition regarding fire precautions, are there any other comments on Summary No. 16 ?

— I therefore declare this latter adopted.

**Mr. Boulanger** (in French). — The whole of No. 16 ?

**Mr. Squilbin** (in French). — Yes the whole of No. 16.

**The President.** — Does everyone agree ?

**Mr. Joncker**, *Netherlands Railways*. — I would like to add to the second paragraph of *b) Heating*, after « ... during long stops »: « ... during runs at reduced power ».

**The President.** — This system can be for both engine and passenger accommodation. Do you agree?

**Dr.-Eng. Gaebler.** — I am in agreement.

**Mr. Squilbin** (in French). — We will therefore add in this paragraph the idea of additional heating when running under low power.

**The President.** — Any other comments?

— *The Meeting adopts the following wording in the case of paragraph b) Heating; paragraphs a) to e) remaining unaltered:*

« (b) *Heating.* — The following systems may be recommended for the heating of railcars, trailers, and control trailers:

- « — hot air heating;
- « — hot water heating;
- « — steam heating;
- « — electric heating.

« Where a hot air or hot water heating system is used in the railcar itself, it is advisable, for the sake of power economy, to make use of the waste heat of the engine coolant. The additional insertion of a heat generator in the heating circuit is to be recommended, permitting pre-heating of the engine coolant and passenger accommodation before going on duty; these systems also allow keeping both the engine and passenger accommodation warm, if there are operating interruptions of long duration; and when the vehicle is working at reduced power.

« Steam heating systems should be

applied only if railcars are to be operated jointly with standard passenger carriages equipped with steam heating.

« The additional expense of electric heating is supportable where Diesel-sets are required with a high standard of comfort.

« Heating systems which make direct use of the heat of waste gases, cannot be recommended for the disadvantages inherent in such systems.

« It is especially important that the heating system used provides for a satisfactory regulation of heat and is quickly responsive to regulator settings.

**Dr.-Eng. Gaebler.** — *Summary No. 17:*

*17. Buffer and traction gear.*

If the possibility has to be envisaged that passenger coaches and goods wagons equipped with the ordinary buffing and draw gear may have to be hauled by railcars, the latter must be equipped similarly. In this event, it suffices, however, to employ a lighter design of such buffer and traction gear, as the loads to be hauled will be light.

Where no such possibility has to be taken into consideration, automatic centre couplings may be used as standard equipment for railcars and their trailers. They are especially advantageous in services requiring quick coupling and uncoupling of units en route.

The automatic centre coupling may be designed to ensure automatic coupling of the brake air line and multiple control circuits.

**The President.** — No comments on that text? Then, I declare Summary No. 17 adopted.

*Summary No. 18.*

**The President.** — Gentlemen, there remains Summary No. 18 dealing with fire protection, which we have already



discussed. The proposed text is worded as follows :

« 18. Fire protection is an important factor in passenger and rolling stock safety.

« The effectiveness of the measures taken for this purpose are implicit in the arrangements provided in the construction. »

— *This text was adopted without comment ?*

**The President.** — Thank you very much Gentlemen for your attention and kind help. I declare the session closed and we will be meeting again tomorrow morning at 9.30 a.m. to deal with Question 4.

## DISCUSSION AT THE PLENARY SESSION.

### Meeting of the 3rd October 1958.

PRESIDENT : Sr. D. AGUSTÍN PLANA.

GENERAL SECRETARIES : Messrs. P. GHILAIN and J. PEREZ POZUELO.

**The President** (in French). — We will go on to examine the summaries relative to Question 3.

**Mr. Ghilain**, General Secretary, read the summaries adopted by the Section which were published in Nos. 2 and 3 of the *Daily Journal* of the Congress.

*(The examination of these summaries did not give rise to any comments.)*

**The President** (in French). — We can therefore consider the summaries for Question 3 as ratified.

#### SUMMARIES.

« 1. The number of types of different  
« designs of Diesel railcars should be  
« limited as far as practicable. The  
« economy of railcar operations im-  
« proves with the number of completely  
« identical units in service in the area  
« of the Administration.

« 2. Whilst it may be necessary, for  
« reasons of traffic requirements, to  
« provide various types of interior arran-  
« gements and equipment, all efforts  
« should be made to maintain unifor-  
« mity of design, as relating to the most

« important components subject to wear  
« and tear (as, for instance, traction  
« power equipment, auxiliary machinery,  
« running gear, brakes, buffing and draw  
« gear, as well as certain details, such  
« as doors, windows, etc.).

« 3. The installation of a single trac-  
« tion power unit (Diesel engine plus its  
« transmission) in each motor unit is  
« the more economical method, if suit-  
« able equipment with the necessary  
« power output is available on the  
« market.

« The installation of two separate  
« units, for reasons of operating relia-  
« bility, is no longer necessary, in view  
« of the present high standard of design  
« and manufacturing technique.

« A subdivision of the total power  
« output in two separate units may be  
« opportune for the following reasons :

« (a) Limitation of types of mechan-  
« ical equipment in use;

« (b) To permit the utilization of  
« engines and/or transmissions available  
« from mass production of the motor  
« vehicle industry, thus benefiting by the  
« relatively low first cost and main-  
« tenance charges for spare parts.

« A division of the power unit in two

« may also become inevitable, if power requirements make the installation of a single unit impracticable.

« 4. High speed Diesel engines are, as a general rule, preferable for use in Diesel railcars because their dimensions are smaller, they are easier to mount and their weight is less.

« 5. Supercharging of Diesel engines (provided the design is suitable), and in particular of 4-stroke engines of medium and relatively high rating, may be recommended for the reason that a notable increase in power — up to 50 % in the higher power ranges — may be obtained at the cost of a relatively modest increase in load and thermal strain.

« 6. Present experience shows that preference is generally given to 4-stroke engines which more easily permit the advantages of supercharging to be applied.

« 7. In the design of a vehicle, particular importance should be attached to accessibility of the power equipment.

« The underfloor arrangement of the latter can be used for small to medium ratings (up to about 500 HP with high-speed engines) and provides the advantage of more space for pay load in the car body. Where it is desirable to have a particularly low level floor, however, space may not be available to permit such arrangement.

« The tractive power equipment of medium to high rating may be installed either in the bogie or in the car body.

« Installation in the bogie offers the advantage of facilitating the exchange of the entire power unit, inclusive of its bogie, but accessibility is more easily attained, even in operation, by installation in the car body.

« The protection of the power unit against bad weather conditions, and dust as well as a more efficient noise insulation are more easily realised with the installation of the engine in the car body.

« 8. The following transmission systems are in use :

« (a) mechanical, hydro-mechanical or hydraulic transmissions for low power ratings. The mechanical transmission has better efficiency. Its drawback is that vehicle speed and engine speed are related in a fixed manner in each gear. Therefore, any equipment having a mechanical gear must have an efficient friction clutch which will compensate for the speed difference between engine shaft and driving shaft during the starting period.

« In more recent times, mechanical gear with hydraulic couplings ahead of them have also been frequently used for this purpose.

« (b) because of increasing construction difficulties with friction clutches as power increases, mechanical gears with hydraulic converters ahead of them, or hydraulic transmission are used for medium up to higher power ratings. Towards the top of the medium range, electric transmissions are in service.

« (c) hydraulic or electric transmissions exclusively for high power rat-



« ings. At the present time, both systems have been giving satisfactory results in service even for higher output. They are practically equivalent as regards their efficiency. The advantages of hydraulic transmission in the starting period have to be compared with the advantages of electric transmission as regards regulation, particularly in the part load range. The question as to which system is to be preferred depends, apart from the operating conditions, on the availability from industry of suitable proved types for the vehicle under design.

« 9. The position of the power unit (Diesel engine with its transmission) in the railcar is influenced by :

« (a) type and location of the Diesel engine, and

« (b) choice of transmission system.

« Both the mechanical and hydraulic transmissions require a more restricted layout of engine, transmission, and driving axles.

« The electric transmission on the other hand, allows greater freedom in the arrangement of the power unit with its generator and the axle drives (traction motors).

« 10. In order to ensure the proper functioning of the power unit in operation and to enable suitable measures to be taken in the event of a breakdown in service, the installation of suitable supervisory instruments to be watched by the driver or of automatic control apparatus is to be recommended, covering for instance, the engine coolant temperature, engine

« coolant reserve, oil pressure and oil temperature.

« Any automatic supervisory equipment should function on the « fail to safety » principle in order to ensure that in case of any failure the equipment under supervision will be switched off. Indicator lamps locating failures should be provided, not on the driver's panel, but in the neighbourhood of the machinery to which they refer.

« Automatic control has the advantage that it :

« (a) is continuous so that it becomes immediately operative in case of failure, and

« (b) leaves the driver free for the performance of his other duties as they relate to train operation, etc.

« Its drawback is a somewhat higher expenditure for first cost and maintenance.

« Traction power installations of high rating, which are necessarily expensive, warrant the installations of automatic control apparatus.

« Alarm apparatus or indicators of a more simple design should prove adequate for less costly power equipment operating under less exacting conditions.

« In the case of automatic control, the indicators provided on the driver's panel should be kept to a minimum, and so far as possible, should consist only of those indicators required to assist him in the operation of the train. A single warning indicator may be provided to cover failure of the power equipment.

« 11. Water cooling of engine has  
« been of general practice up to the pre-  
« sent. It is known that air cooling has  
« been used in a limited number of cases  
« in the lower power engines.

« Water-cooled Diesel engines make  
« protective measure of the cooling sys-  
« tem advisable against :

« (a) corrosion and erosion;

« (b) scale formation and incrustation;

« (c) freezing during the cold season.

« 12. For hydraulic transmissions with  
« coupling characteristics and for me-  
« chanical transmissions, the inclusion  
« of a protective device for the engine  
« against overspeeding through torque  
« exerted by the driving axles is to be  
« recommended.

« 13. The driving position(s) of Die-  
« sel railcars and their control trailers,  
« if any, and of multiple-unit sets, res-  
« pectively, should be arranged in such  
« a manner that :

« (a) a good visibility is ensured;

« (b) the travelling direction may be  
« reversed without turning the vehicle.

« These conditions are most satis-  
« factorily fulfilled with the driving posi-  
« tion(s) arranged at the end of the  
« vehicle.

« But the provision of a single driv-  
« ing position at a high enough level  
« either at one of the ends or at about  
« the centre of the railcar also ensures a  
« satisfactory visibility, even if a trailer  
« is running ahead of the motor unit,  
« provided the vehicles are not excessi-  
« vely long.

« Where two cabs are provided, high-

« level positions afford greater safety  
« to the driving staff, especially in such  
« cases where part of the power unit is  
« built into the car body immediately  
« in front of the driving position at the  
« level at which an impact with possible  
« obstacles on the track might occur.

« Care should be taken in the design  
« of the driving position to ensure that  
« the driver is protected from eye strain  
« due to the inclusion in his line of  
« vision of the track passing directly  
« beneath his eyes.

« The provision of a driving position  
« at each end of the set suffices for twin  
« or multiple-unit sets, the components  
« of which are never used separately.

« 14. In railcars used under simpli-  
« fied conditions, with a single power  
« unit and not required to run jointly  
« with a control trailer or other motor  
« units, direct mechanical control of the  
« power unit and its auxiliary is possible  
« and adequate. This type of control is  
« reliable and economical to purchase  
« and maintain, because of its simple  
« construction.

« On the other hand, railcars to be  
« used jointly with a control trailer or  
« other motor units should be equipped  
« with remote control, unless the cost of  
« the staff needed to attend two or more  
« power units represents a smaller mo-  
« ney outlay than the building, operation  
« and maintenance of multiple control  
« equipment.

« In designing for a strictly limited  
« combination of power units e.g. a twin  
« unit, a relatively simple and inexpen-  
« sive multiple control may be provided.

« When the traffic requirements in-

« involve the use of a larger number of  
« power units, operated together by a  
« single driver, a multiple control system  
« in conjunction with fully automatic  
« supervision of power units, as described in item 10, is necessary.

« 15. One of the determining factors  
« of economic operation of Diesel railcars is the structural weight, as it influences :

« (a) the determination of required  
« power output;

« (b) the fuel consumption;

« (c) the extent of wear and tear (in particular of the running gear components and brakes), and consequently, the extent of maintenance costs;

« (d) the purchase price.

« It is advisable to limit the weight  
« — without impairing the safety of passengers, reducing travelling comfort to any noticeable extent or incurring liability of heavy maintenance and renewal costs — to an economically tolerable minimum value.

« Efforts to effect weight savings should extend to all components of the railcars and their trailers and control trailers.

« A reasonable additional charge incurred by increased expenditure for design and materials as a consequence of an intensified lightweight construction may be tolerated to a certain extent, in view of the expected savings.

« Construction methods recommended to effect weight savings are :

« (a) use of cellular or tubular methods of construction;

« (b) light-weight construction in steel  
« with extensive welding;

« (c) combined steel and light alloy  
« construction;

« (d) application of light metals and  
« their alloys and plastics;

« (e) utilization of light-weight mechanical equipment and other fittings;

« (f) use of new types of suspension.

« 16. At the designing stage of Diesel railcars, the following measures suitable to enhance travelling comfort should receive careful attention :

« (a) *Insulation against noise and vibrations* involving, so far as the car body is concerned :

« — prevention of drumming;

« — absorption of noise;

« — insulation against noise including the avoidance of openings admitting noise in the car body. When openings are unavoidable, they should be carefully sealed to prevent noise from reaching passenger accommodation;

« and relating to the engine and its auxiliaries :

« — insulation against noise and vibrations produced by the traction power equipment.

« A certain increase of the weight of the vehicle caused by insulation requirements is justified.

« (b) *Heating*. — The following systems may be recommended for the heating of railcars, trailers, and control trailers :

« — hot air heating;



« — hot water heating;

« — steam heating;

« — electric heating.

« Where a hot air or hot water heating system is used in the railcar itself, « it is advisable, for the sake of power « economy, to make use of the waste « heat of the engine coolant. The additional insertion of a heat generator « in the heating circuit is to be recommended, permitting pre-heating of the « engine coolant and passenger accommodation before going on duty; these « systems also allow keeping both the « engine and passenger accommodation « warm, if there are operating interruptions of long duration; and when the « vehicle is working at reduced power.

« Steam heating systems should be « applied only if railcars are to be operated jointly with standard passenger « carriages equipped with steam heating.

« The additional expense of electric « heating is supportable where Diesel-sets are required with a high standard « of comfort.

« Heating systems which make direct « use of the heat of waste gases, cannot « be recommended for the disadvantages « inherent in such systems.

« It is especially important that the « heating system used provides for a « satisfactory regulation of heat and is « quickly responsive to regulator settings.

« (c) *Ventilation*. — The ventilation « of railcars used under ordinary conditions should be effected by opening « windows and the provision of static « suction ventilators on the roof; for « services with a higher standard of com-

« fort, the installation of electric fans « may be envisaged.

« Hot air heating systems should be « designed in combination with the ventilation of the car interior.

« It is self-evident that, except for « countries with an unusually hot climate and subject to dust conditions, « and apart from vehicles offering a « rather high standard of comfort, the « provision of an air-conditioning plant « is prohibitive on account of its high « cost and additional weight. Where « such an installation is included, it is « recommended that it should have its « energy supply provided by a separate « generator, driven by an auxiliary « Diesel engine.

« (d) *Gangways*. — If the kind of « service provided supports the additional expenditure, it is advisable « to provide gangways for the passengers « between the individual railcars in a set, « designed as :

« — gangway floor plates, normally « for the use of railway staff only;

« — gangways with bellows of various designs as a protection for passengers against weather conditions and « for safety and other reasons where a « certain degree of comfort applies to « the vehicles.

« (e) *Running gear*. — The running « gear should be designed to ensure an « optimum of riding stability, even with « an average state of maintenance of the « permanent way.

« With the exception of the most « simple designs, bogies should be used « in the running gear.

« As an additional means to improve riding stability, one or more of the following devices should receive careful attention :

« — coil springs or torsion bars, practically self-damping, for the secondary and primary suspension, together with hydraulic shock-absorbers; special care must be taken to counterbalance the natural frequency of vibration of the various suspension systems;

« — self-damping springs of rubber or combined designs of steel and rubber;

« — guide bars between axle-boxes and bogie frames, instead of the ordinary axle-boxes sliding in the horn guides, to eliminate the play in the longitudinal and transverse axes and to avoid wear and tear;

« — locating the bogie pivot at the lowest practicable level.

« Air spring systems, as well as any other design of springs with a gas or vapour chamber, have thus so far seen little use in the design of railway vehicles, so that experience with this type of suspension is still lacking. However, it may be opportune to study the applicability of such systems, especially in view of the fact that the tendency is unmistakably in the direction of light-weight construction. With this type of construction the value of the inherent possibility of these sys-

tems to ensure an automatic adaptation of characteristics to widely fluctuating loading conditions is obvious. These new systems may show the way towards genuine improvements; several experimental vehicles are already in use.

#### « 17. *Buffer and traction gear.*

« If the possibility has to be envisaged that passenger coaches and goods wagons equipped with the ordinary buffing and draw gear may have to be hauled by railcars, the latter must be equipped similarly. In this event, it suffices, however, to employ a lighter design of such buffer and traction gear, as the loads to be hauled will be light.

« Where no such possibility has to be taken into consideration, automatic centre couplings may be used as standard equipment for railcars and their trailers. They are especially advantageous in services requiring quick coupling and uncoupling of units en route.

« The automatic centre coupling may be designed to ensure automatic coupling of the brake air line and multiple control circuits.

« 18. Fire protection is an important factor in passenger and rolling stock safety. The effectiveness of the measures taken for this purpose are implicit in the arrangements provided in the construction. »

---

#### QUESTION 4.

Comparative study of the periodical maintenance and repair of electric locomotives, in particular as regards :

- the wear of the tyres (influence of the wheel diameter, the axle-load, the speed, the type of bogies and eventually undulatory wear of the rails, etc.);
- the maintenance of traction motors and their transmission (flash at the collectors and methods of coping with it, use of roller bearings for the suspension of the motors and the hollow shafts, etc.);
- lubricants used (classical and such new types as bisulphide of molybdenum);
- wear of the friction strips of the pantographs.
- Kind of work and periodicity.
- Organisation of the maintenance and influence of common user (banalisation) of the locomotives.
- Prime cost in relation to the type of equipment and the age of the engines.

#### Preliminary documents.

Report (Austria, Belgium and Colony, Bulgaria, Cambodia, Czechoslovakia, Denmark, Ethiopia, Finland, France and French Union, Western Germany, Greece, Hungary, Indonesia, Italy, Lebanon, Luxemburg, Netherlands, Poland, Portugal and overseas territories, Rumania, Siam, Spain, Switzerland, Syria, Turkey, Union of Soviet Socialist Republics, Viet-Nam and Yugoslavia), by M. VIANI. (See *Bulletin* for July 1958, p. 1025.)

Australia [Commonwealth of], Burma, Ceylon, Egypt, India, Irak, Iran, Republic of Ireland, Japan, Malaysia, New Zealand, Norway, Pakistan, South Africa, Sudan, Sweden, and the United Kingdom of Great Britain and Northern Ireland and dependent overseas territories), by K. J. Cook. (See *Bulletin* for March 1958, p. 499.)

Supplement to Report, by K. J. Cook. (See *Bulletin* for August 1958, p. 1279.)

Special Report, by K. J. Cook. (See *Bulletin* for September 1958, p. 1363.)

Report (America [North and South],

### DISCUSSION BY THE SECTION.

#### Meeting of the 2nd October 1958.

PRESIDENT : J. RATTER.

— The meeting began at 9.30 a.m.

**The President.** — Ladies and Gentlemen, we now have to start with Ques-

tion No. 4. In the text of the special report, as you will see, the summaries for Question No. 4 have not been bro-



ken down into specific paragraphs or points. To facilitate the discussion, Mr. Cook, *Special Reporter*, is going to read out some small points which he has decided upon himself to break down the text, and we will debate each point separately. Firstly, I am going to ask Mr. Cook to introduce his *special report*, after that we will begin the discussion of the summaries.

**Mr. Cook, *Special Reporter*.** — Mr. President, Ladies and Gentlemen, Question No. 4 deals with the maintenance of electric locomotives. A number of Administrations have no portions of their lines electrified and therefore cannot contribute information, and some are also restricted by virtue of operating only passenger trains with multiple-unit coaching stock.

However, twenty-four Administrations have furnished information, and my colleague Mr. VIANI, *Reporter* for the French speaking countries, and I are grateful for the detailed replies to our questionnaire which they have sent.

The year 1955, relating to which information was requested, is not completely static except for a very small number of electrifications as in many cases electrified lines had not been in full operation for much time, or further extensions were in hand.

Up to the present, in general, a small proportion of traffic is electrically hauled, but there are some small Administrations which are completely electrified, and Holland appears to work 80 % of its gross ton-kilometres by electric traction.

Geographical characteristics exert a

great influence upon a number of the statistical results. The annual mileage per locomotive is lower than one might expect and in many cases this is caused by the total length of electrified lines being relatively short, and turn-round time of locomotives and perhaps the non-availability of trains at all times become large in proportion. On the other hand, Administrations operating long tracks, and particularly through-continental lines, are able to quote annual mileages approaching 200 000 miles (320 000 km).

This feature and also those of gradients and the number of stops and starts affect other aspects, particularly tyre wear and the mileages obtainable between tyre turnings.

There are some features and objects which are common to all Administrations, particularly the following :

(1) the employment of universal or mixed traffic locomotives capable of working both passenger and freight traffic;

(2) continuous working of the locomotives to obtain high mileages between heavy repairs;

(3) the common user of locomotives by change of crews at traffic terminal points or at stopping points en route.

It is generally reported that rail wear is greater, and therefore the life of rails shorter, than under traction with steam but direct comparison is difficult. When lines are electrified a more extensive service is generally provided and therefore the use of the track is greater. It is recognised that lubrication of rails and wheel flanges is beneficial in reduc-

ing wear of both rails and tyres on curved track, and the application of oil or grease to the rails does provide lubrication to both parts.

Rail steel and tyre steel are of approximately equal hardness and there are no very fine limits specified for a P over D ratio, i.e. total axle loading over wheel diameter, but general desires are that it should not exceed 5 in English tons/foot or 16 Metric tons/m.

Up to the year under review, axle-hung, nose-suspended traction motors were universal and therefore no comparisons are available to indicate whether other forms of motor suspension gave better results.

There is general uniformity in the pattern of maintenance of traction motors and of the locomotives as entities. There are short period inspections — in the case of traction motors these are primarily for examination of brushes — and long period inspections and overhauls. The universal aim is to obtain a long period and high mileage before major overhaul is necessary, and to immobilise the locomotives as little as possible for inspections so that they may work as continuously as possible. Long life of commutators before returning becomes necessary and is an essential condition, and balance must be held between the desire for smaller and lighter motors and long life of commutators and brushes, and absence of flash-over.

The reports set out in considerable detail the practices of the various Administrations concerning periods and mileages between inspections and over-

hauls, and also types of motors, dimensions and materials of pantograph collecting strips. The decision regarding the material employed in the strips may be largely influenced by the system voltage, and therefore inversely by the current required and the limitation in the collecting capacity of carbon strips reported by one Administration may not exist where the line voltage is much higher.

Very much can be done in reducing non-availability of electric locomotives by changing bogies and other units where tyres are worn, or repairs of other details are necessary until the major renewal of cabling within the locomotive becomes necessary.

It is not usual for any maintenance work to be carried out by locomotive driving crews who only carry out minor preparation work before operating the locomotive. All maintenance and examinations of mechanism are carried out by depot or workshop staff, but there is an exception to this.

An endeavour has been made to furnish the information called for regarding maintenance costs but conversion of currencies and equating of other variables make this very difficult. The *Reporters* felt that the only way this could be presented was as a percentage of capital value, but they realise that due to geographical and other factors this may be by no means infallible. Nevertheless, the information so presented may be of value by individual analysis.

In discussing the summaries, I propose to divide Chapter II into three parts and to take first of all the first two paragraphs.

Here is the text of *Summary No. 1* (Paragraphs 1 and 2 of Chapter II):

## CHAPTER II.

### Wear of rails and tyres.

The useful life of rails under electric traction is less than with steam traction, the reduction reported ranging from 8 to 50 %. This is not only due to electrification itself, but is also due to the more intensive services which normally accompany electrification.

Flange wear on tyres has been greatly reduced by the provision of track oilers placed at suitable positions at curves or on the locomotives. The reduction of flange wear is of great economic importance as approximately three times the flange wear has to be removed from the tread of the tyre to reform the flange.

**Mr. Ivancević, Yugoslavian Railways** (in French). — Before we start discussing Mr. Cook's report, I would like to make a remark about Mr. VIANI's report.

In the last paragraph on p. 863/19 (\*), Mr. VIANI makes a distinction between the railways: on the one hand, those of great importance, and on the other those which are not so important.

For example the Spanish Railways are of great importance, whilst the railways of Austria and the U.S.S.R. are not.

We would be very interested if Mr. VIANI would tell us upon what criteria he based this classification.

**The President.** — I must ask you this, we can only deal at this meeting

with the summaries, we cannot discuss the text of the original reports. With regard to the point you wish to raise, perhaps you could deal with it direct with Mr. VIANI after the meeting, because we must keep to the summaries.

**Mr. Ivančević**<sup>1</sup> (in French). — Agreed. I will therefore go on to Summary No. 1. The first paragraph includes the idea of the « useful life of the rails ». This is such an indefinite idea that it should not be mentioned in the summaries; it depends, in effect, upon several operating factors, amongst which I might mention:

- the composition of the trains;
- the number of gross tons/kilometre per kilometre of line;
- the frequency with which trains have to brake and make use of sanding, as well as the type of brake;
- the axle load of the locomotive and of the train;
- the type of locomotive, and in particular its rigid wheelbase;
- hunting;
- the gyroscopic influence of the masses in rotation;
- the height of the centre of gravity of the locomotive and the wagons;
- the superelevation of the rails on curves.

I suggest therefore that we retain the sentence used by Mr. Cook in his report on p. 676/4 (\*\*):

« The replies indicate that the useful

(\*) *Bulletin* for June 1958, French edition; English edition: *Bulletin* for July 1958, p. 1029/17.

(\*\*) *Bulletin*, French edition; English edition: *Bulletin* for March 1959, p. 222/4.



life of rails under electric traction is less than with steam traction, but a quantitative comparison is difficult as there is... ».

**Mr. Cook.** — Mr. President, it is very difficult to quote a more accurate figure, this range of figures has been quoted by the Administrations and there may be extreme circumstances which have caused the wide variation but it is impossible to differentiate in the summary.

**The President.** — I think we could add to this that not only does the life reduction vary from 8 % to 50 % between various Administrations, but it probably varies an equal amount within an Administration because of track and other geographical details.

**Mr. Ivancević** (in French). — But so many different factors come into the life of the rails that, from the replies received from the Administrations, it is quite impossible to draw the proposed conclusion.

Consequently, we should not give any percentage figures in this summary.

**The President.** — Have you any comments on that?

**Mr. Cook.** — The life of rails under electric traction according to some Administrations is less than with steam traction, this is not only due to electrification in itself but largely to the more extensive service which normally accompanies electrification.

**Mr. Martin, French National Railways** (in French). — Mr. President, I agree with the remarks made by the Jugoslavian Delegate.

As far as France is concerned, we do not think there is any connection between the method of traction and the wear of the rails in any appreciable way.

However, the Reporters gave factual information supplied by certain Administrations. Consequently, I suggest that the paragraph we are discussing be replaced by a less definite statement, in which we might say, for example :

« The length of life of the rails... »

— I prefer « length of life » to « useful life », as there is no useless life in the case of rails.

« The length of life of the rails is, according to certain Administrations, shorter with electric traction than with steam traction. »

I suggest that no figure be given, and the paragraph would continue as follows :

« This shorter life is not due solely to electrification itself, but above all to the more intensive services that usually accompany electrification. »

**Mr. Viani, Spanish National Railways and Reporter** (in French). — In reply to Mr. MARTIN, I would say that the wear of the rails depends on certain circumstances due not only to electrification but also to various factors which may occur when electrification takes place.

For example, our first electrification project using 3 000 V was carried out at Pajares. This has been in operation

since 1925. At a certain time, in 1955, we carried out a general renewal of the track in order to lay heavier rails. This coincided with the putting into service of a type of CC locomotive with no couplings between the bogies.

We then recorded extraordinary wear of the rails at certain places, in particular at switches, which made it necessary to replace the rails after only two years in service. We overcame this trouble by equipping the locomotives with coupling springs and the wear completely disappeared.

For this reason, when an electrified line is first put into service, it is very difficult to decide whether abnormal wear of the rails is due to the electrification itself, or to other factors which could not be foreseen at first.

**The President.** — How do we stand now? Mr. MARTIN has proposed to shorten and alter the first paragraph of the summary, chiefly by removing the reference to percentages and I wonder if there is anything you would like to add.

**Mr. Cook.** — In fact, the paragraph remains as it is, with the exception of the indication 8 to 50 %. A good number of details mentioned by the first speaker are common to steam practice and many of the trains are present under steam operation; the only difference is the increase in numbers traffic which may be due to electrification or, perhaps, the height of the centre of gravity, which may be affected by electrification. I have no objection to the amendment as proposed.

**The President.** — Are there any other points on the first paragraph?

**Mr. Stevens, East African Railways and Harbours.** — My Administration has no electrification at present, but it is a possibility some time in the future. It seems to me that it would be a pity to delete the percentages as they give an indication of what may be expected.

**The President.** — Are there any other points on this paragraph?

**Mr. Nouvion, French National Railways** (in French). — If we state that there is 50 % more rail wear with electric traction compared with steam traction, this is as good as saying — quite justly — that electrification should never be undertaken.

As far as we are concerned, we have not found more wear with electric traction than with steam traction.

That is why I propose that this paragraph be completely suppressed.

Mention is only made of those Administrations with unfavourable figures. Why not also mention those who have not found any difference between electric traction and steam traction?

**Mr. Cook.** — Mr. President, that would not be in accordance with the information received.

**The President.** — I think the conclusion we should decide upon is this. We should delete the percentages, they are given in the report. I think 50 % must be at least very exceptional and I be-

lieve an electrical engineer would not like to see it in sprint whatever a steam engineer might feel. Therefore, I would like to suggest we accept the recommendation which Mr. MARTIN has proposed as an adjustment to the text. (*Signs of assent.*)

**Mr. Alström, Swedish State Railways.** — In paragraph 2, with regard to the term « track oilers », I would ask if it should not state for example « track or flange lubricating devices » or something like that.

**The President.** — Yes.

**Mr. Squilbin (in French).** — At the beginning of the second paragraph, we would say therefore :

« The wear of the flanges of the tyres has been considerably reduced, thanks to the use of *track or flange lubricators*, placed either at suitable positions on curves or... »

**Mr. Ravenet, French National Railways (in French).** — I am not completely in agreement with the suggestion just made, because in France we put lubricators on our locomotives which lubricate the rail, not the flanges of the locomotive.

I would prefer to retain the *Reporter's* text.

**Mr. Alström.** — We have these devices too, they are lubricating the contact area of the wheels and the rails and that is why they are fitted, not to lubricate either the rail or flange only

the contact area. We have as a matter of fact in Sweden such devices which lubricate the flange of the rail from the locomotive, that as I suggest, it would be all right to say track or flange lubricators placed at suitable positions on the track or on the locomotives.

**Mr. Collins, Coras Iompair Eireann.** — I suggest it should be worded « by the provision of lubricators placed at suitable positions at curves or on the locomotives ».

**The President.** — Does that meet your point ?

**Mr. Alström.** — Yes.

**Mr. Squilbin (in French).** — The English text of the report meets Mr. RAVENET's remark. Perhaps, we could be more precise and say : « track lubricators, placed either at suitable positions on curves or on the locomotives, or again flange lubricators » to cover the case quoted by Mr. ALSTRÖM.

**The President.** — Is the point met by the deletion of the word « track » in the English translation and leaving the French text as it is ? No comment from you Mr. Cook ?

**Mr. Cook.** — No comment.

**The President.** — Everyone agreed ? (*Approved.*)

**Mr. Ivancević.** — In the same chapter, at the end of the second paragraph it says :



« ... seeing that in order to remake the flange when reprofiling, it is necessary to remove about three times the wear of the flange from the running surface of the tyre... »

This statement is only more or less accurate when turning is used to obtain the required profile.

When the worn parts of the tyre are built up by welding to begin with and the tyre is then turned, or when some other technological method is used, this statement is no longer accurate.

I suggest therefore that this sentence be deleted from the summaries.

**Mr. Cook.** — That, Mr. President, can be included, I agree, by adding the words « the heavy deposition of weld metal or the extensive deposition of weld metal on the flange ».

**Mr. Ravenet** (in French). — I do not think it is opportune to introduce the idea of welding the tyres, as this method is not in very general use on the different Administrations.

Moreover, the figure quoted by the *Reporter* seems right to me.

**Mr. Maass**, *South African Railways and Harbours*. — I support the view of the S.N.C.F.

**Mr. Cook.** — I would prefer that solution to be used and not emphasise too much the deposition of weld metal. I would think in the first line after « tyres », we ought to add « and the side cutting of rails ».

**The President.** — The flange wear of tyres and the side cutting of rails have been greatly reduced. I think then, unless any one would like to say something else, we should adhere to the text, subject to the amendment proposed « and the side cutting of rails », and adopt the text as far as we have gone as now amended. I declare this second paragraph accepted.

— *The final text of Summary No. 1 is worded as follows :*

#### « Wear of rails and tyres.

« 1. The life of rails under electric traction, according to some Administrations, is less than with steam traction. This is not only due to electrification itself, but in particular to the more intensive services which normally accompany electrification.

« Flange wear on tyres and side cutting of rails has been greatly reduced by the provision of lubricators placed at suitable positions at curves or on the locomotives. The reduction of flange wear is of great economic importance as approximately three times the flange wear has to be removed from the thread of the tyre to reform the flange. »

#### **Mr. Cook :**

##### *Summary No. 2*

*(paragraphs 3 to 6 of Chapter II) :*

Permitted limits of wear of tyres vary considerably and there does not appear to have been any scientific or mathematical approach to establish the safe limits of the tyre profiles.

It has not been possible to establish any relationship between the type of suspension of the motors and tyre or rail wear. Although at first sight it would seem logical to suppose that completely suspended motors

should have a beneficial effect, nearly all Administrations have used only axle hung or nose suspended motors. Much attention is however now being devoted to the application of fully suspended motors and it is anticipated that appreciable reduction of track wear will follow.

Practically all new electric locomotives are being constructed in the double bogie designs which limit wheel diameter to a maximum of about 4 feet (1.250 m). This does no doubt increase tyre wear and rail end hammering, although there are no quantitative effects to report and it is considered that the obtaining of 100 % of locomotive weight for adhesion justifies this.

Tyre wear does not vary in any relationship to its machined diameter within the overall variation permitted between maximum and minimum thickness.

**Mr. Nouvion** (in French). — It cannot be stated that the question of completely suspended motors begins only to be examined.

As far as we are concerned, since 1946, all the locomotives ordered, i.e. more than 600, have been fitted with completely suspended motors. The only exceptions were 122 locomotives specially allocated for freight traffic whose maximum speed is 60 km/h.

We shall never go back to nose suspended motors, even in the case of individual drive.

We have made absolutely conclusive trials, using the same stock assuring the same services, some units fitted with completely suspended motors and others with nose suspended motors.

Experience has proved the overwhelming superiority of completely suspended motors.

Moreover, I might point out that in so doing and completely suspending the motors, we did not have in mind the

protection of the permanent way but rather of the motor itself, which is the essential purpose of the completely suspended motor.

The hammering at the rail joints also will tend to disappear since the use of long welded rails is being increasingly extended.

**Mr. Cook.** — I do not think that these indications were in your report to us. I was rather surprised that there were no reports of fully suspended motors. Up to 1955, no Administration reported fully suspended motors.

**Sir Brian Robertson**, *British Transport Commission*. — I have been very interested in the remarks just made by the French representative. I speak as a non-technical member of management. I would say that management looks to this Congress for guidance on technical questions, and what does this paragraph say? It says in the first line: « It has not been possible to establish any relationship between the type of suspension of the motors and tyre and rail wear », and the last sentence says: « Much attention is, however, now being devoted to the application of fully suspended motors and it is anticipated that appreciable reduction of track wear will follow ». These two sentences are contradictory and management will not know what guidance to take from this Congress. I would hope something more definite would be put in and I think the remarks of the French representative are very pertinent.

**Mr. Cook.** — As I mentioned before, the first part referred to by SIR BRIAN

is based on the reports received. I agree that the last part was put in because of the trend, and I felt it ought to go in but it is entirely irrelevant to the reports received from the Administrations.

**Mr. Martin** (in French). — In reply I would remind the *Reporter* that the question asked was the following :

« What is the influence of the type of suspension of the motors on the wear of the tyres ? »

We replied in effect that no very precise, very definite correlation had been established between the type of suspension of the motors and the wear of the tyres.

But, as Mr. NOUVION has pointed out, we have however very definitely made it the general practice to use completely suspended motors, not in endeavouring to reduce the wear of the tyres or the rails, but essentially to protect the motor.

Consequently, perhaps we should have expressed this point of view in a supplementary paragraph in our Report, but, in view of the wording of the question, we did not develop this idea explicitly.

I think it is important that this should be done in the summary. So, if you agree, I will make a definite suggestion.

First of all, at the beginning of the paragraph :

« It has not been possible to establish any relation... », etc., we might add :

« any *definite* relation between the method of suspension of the motors and the wear of the tyres or the rails. »

On the other hand, I would then

suggest replacing the last paragraph which reads :

« The use of fully suspended motors is now being more fully examined and it is to be expected that this will result in a considerable reduction in the wear of the track », by :

« The use of fully suspended motors, with the object essentially of improving the behaviour of the motor itself, also should lead to an appreciable reduction in the deterioration of the wheels and rails. »

I have used the conditional since we have as yet not precise data to give.

I think the statement is justified, but at the present time we cannot give any figures to prove it.

In any case, I repeat, the use of fully suspended motors is intended to protect the motor and make it last longer.

**Mr. Viani** (in French). — We have used suspended motors in our locomotives but always with the object of protecting the motor rather than the permanent way.

**The President.** — Any comments ?

**Mr. Cook.** — I am agreeable.

**The President.** — May I just ask one question. In the proposal of Mr. MARTIN, after saying that the fully suspended motor is being applied for the benefit of the motor itself, it is anticipated that there would be an appreciable reduction of tyre wear. Track wear is also mentioned in the reports. Is it your wish



that both tyre and track wear should be put into the final paragraph?

**Mr. Ravenet** (in French). — I think both the track and the tyres should be mentioned together.

In effect, it is possible to hope that this arrangement will lead to a reduction, if not in the normal wear of the tyres, at least in exceptional deterioration which unfortunately often occurs on certain types of locomotives.

**Mr. Ivancević** (in French). — It says in the first paragraph of Summary No. 2 :

« ... and it does not appear that the establishment of safety limits in connection with the profile has been the subject of scientific or mathematical studies. »

Although this may be true, I suggest that this is not mentioned. It is quite obvious that the limit of wear for tyres adopted by certain Administrations is the result not only of considerations of a scientific nature, but also resulting from experience and practice, which must not be overlooked.

In the second sentence of the second paragraph of this same summary, it is stated :

« Although at first sight, it would appear logical to suppose that fully suspended motors will be advantageous from this point of view, nearly all the Administrations have only used nose suspended motors. »

I am of the opinion that this sentence should not be included in this form in the summaries. The most that should

be done would be to stress the fact that the majority of the Administrations use the tramway type of suspension for the motors.

The same paragraph ends with the words :

« ... more closely and it is to be expected that an appreciable reduction in the wear of the permanent way will follow. »

I think that what we are now examining should prove itself before being mentioned in our summaries. There are better theoretical designs than fully suspended motors, which are also under examination, for example suspension between the tyres and the spokes of the wheels.

In the third paragraph of Summary No. 2, second sentence, it says :

« Although no quantitative data have been given concerning this subject, there is no doubt but that it should lead to an increase in the wear of the tyres and the hammering of the ends of the rails, but it is considered that obtaining an adhesive weight equal to the total weight of the locomotive justifies this increase. »

I think this sentence should be deleted from the summaries. Especially as such an affirmation does not follow from the replies received, but would appear to be based on the Reporter's own knowledge.

Apart from this, it is necessary to stress that increasing the axle load as a function of the diameter of the wheels is not a characteristic solely of electric locomotives, but also and especially of the new two axled wagons.

This is a further reason why such a characteristic should not be stressed in the summaries which relate solely to electric locomotives.

**The President.** — Perhaps on the first point it might be helpful to suggest this; as the text says: « and there does not seem to be any scientific or mathematical approach ». Science is a wide term, application of engineering knowledge is a science. There does not appear to have been any common formula adopted, and I would like to suggest that we try to adopt one. Perhaps, we might take that point first. Would that modification be approved Mr. Cook? (*Assent shown.*)

Well, would you write out an amended summary affecting the nose suspended motor, and see if it is agreeable to Mr. IVANČEVIĆ.

**Mr. Squilbin** (in French). — The paragraph to which Mr. IVANČEVIĆ is referring has already been modified after Mr. MARTIN's comment, and now reads:

« It has not been possible to establish any definite relationship between the method of suspension of the motors and the wear on the tyres or rails. Although at first sight it would appear logical to suppose that fully suspended motors would be advantageous from this aspect, nearly all the Administrations have only used nose suspended motors.

« The use of fully suspended motors which is intended essentially to improve the behaviour of the motor itself, should also lead to an appreciable reduction in the deterioration of wheels and rails. »

I think that the sentence:

« ... nearly all the Administrations have only used nose suspended motors » should satisfy Mr. IVANČEVIĆ.

**Mr. Ivančević** (in French). — No, because I am not speaking solely of motors, but also of axles and weights.

**Mr. Mottay, Secretary** (in French). — In the case of the third paragraph, here is the second sentence:

« Although no quantitative data have been given on this point, there is no doubt that the result will be an increase in the wear of the tyres and the hammering of the ends of the rails, but it is considered that obtaining an adhesive weight equal to the total weight of the locomotive justifies such an increase. »

This was the last point raised by Mr. IVANČEVIĆ.

**Mr. Ivančević** (in French). — « Although at first sight it appears logical », what does this mean? What appears logical?

**The President.** — Mr. IVANČEVIĆ asks why it is logical to assume that the nose suspended motors would have a beneficial effect on the track.

**Mr. Cook.** — I think it is a first principle, damage by unsprung weight would be lessened.

**Mr. Ivancević** (in French). — Perhaps Mr. Cook is right, but at the present time, we are also making trials in this field. We cannot say here that it is logical.

**Mr. Squilbin** (in French). — We do not say that it is logical; we say « it appears to be logical ».

**Mr. Ivancević** (in French). — As far as I am concerned, it does not make sense.

**Mr. Nouvion** (in French). — All that has to be done is to suppress the phrase. (*Signs of assent* from Mr. IVANČEVIĆ.)

**The President.** — I think we could get out of this difficulty. I believe it is fair to admit that complete suspension would have a beneficial effect. We have only to look at the next sentence when we say: « ... will give an appreciable reduction of track wear ». We can delete the words: « although at first sight it would seem logical to suppose that completely suspended motors should have a beneficial effect » but we should include: « nearly all Administrations have so far used only axle hung or nose suspended motors ».

**Mr. Koster, Netherlands Railways.** — The statement given here certainly does not comply with the answers given by my Administration. The answers I have here, say that 80 % of our locomotives have entirely suspended motors of which the first was put into service in 1948.

**Mr. Cook.** — I think my wording « nearly all » is perhaps incorrect. I think it would be better to say « most Administrations », I believe that is correct. More reported axle hung motors than reported fully suspended motors.

**The President.** — Is this on the same point?

**Mr. Alström.** — We are using as Mr. KOSTER only fully suspended motors up to 82 %, the reason is, of course, mentioned by our S.N.C.F. colleagues to protect the motor and secondarily to protect the rail, but not to establish reduced wear of the track, not minimise wear but to minimise the unsuspended weight on the rail.

**The President.** — I would like to suggest, Gentlemen, that this paragraph is revised in the light of what has been said and put before you at the next meeting. So if you will accept that, are there any remarks on the second part of Summary No. 2, which Mr. Cook has read out?

**Mr. Gerber, Swiss Federal Railways** (in French). — Regarding the third paragraph of Summary No. 2 (first paragraph of p. 1379 of the September 1958, *Bulletin*, French edition [\*]), I would like to point out that in Switzerland we have had bogie locomotives with 20 tons per axle, maximum speed 125 km/h since 1943.

According to our experience, the wear of the tyres of these locomotives with two or three axled bogies is much reduced since the flanges have been lubricated and the bogies have been coupled together laterally.

The wear of the tyres of these locomotives is much lower than that of locomotives of older designs.

---

(\*) Second paragraph of p. 1383/51 of the September 1958, *Bulletin* (English edition).



Consequently, I suggest deleting the first paragraph of this page.

**The President.** — Is this remark in fact based on the reports received?

**Mr. Cook.** — Well, it is rather a negative deduction.

**The President.** — Any other comments on that paragraph?

**Mr. Alström.** — In the last lines of this paragraph it says: « and it is considered that the obtaining of 100 % of locomotive weight for adhesion justifies this ». In fact, it is nearly impossible to have 100 % of the locomotive weight utilised for adhesion, as everyone knows. We have the axle even for a 4-axle BB locomotive, for example. I would like to suggest to say: « it is considered that the utilisation of all axles of the locomotive for adhesion justifies this » instead of 100 %, that does not exist.

**Mr. Cook.** — The previous proposal deals with the suppression of the whole paragraph, therefore, we need not discuss the percentage.

**M. Martin** (in French). — For my part, I do not agree that we should suppress this paragraph, which in my opinion contains some absolutely essential points.

On the other hand, to take the remark just made into account, I see no objection to stating at the end:

« ... but it is considered that these drawbacks are largely compensated by

the advantage of the total adhesion of the locomotives. »

**Mr. Cook.** — Mr. President, I suggest that we alter this to: « it is considered that the utilisation of all wheels for adhesion is justified ».

**The President.** — I think the best thing to do is to extend the revision to include that paragraph. Now, we must get on with the next summary. We will include a revision of the next paragraph with the other two and submit a complete text for Summary No. 2 at the next meeting.

**Mr. Ravenet** (in French). — Mr. President, if possible in the new wording I should like a slight modification to be made in the form of the French text.

In the paragraph under discussion, mention is in effect made of the wear of the tyres and, on the other hand, of the hammering of the ends of the rails.

Wear of the tyres is deterioration; the hammering is only the means causing the deterioration.

Consequently, in the new wording I should like the word « matage » substituted for the word « martèlement ».

To go back to Mr. NOUVION's suggestion once more, I think that at the end of this paragraph it might be possible to add a sentence possibly worded as follows, in order to refer to the use of welded rails:

« Moreover the extent of damage to the ends of the rails can be reduced by using welded rails. »

**The President.** — We will take that into account when revising the text. We will give a new redrafted text at the next meeting. I will ask Mr. Cook to pass on to Summary No. 3.

**Mr. Cook :**

*Summary No. 3*

*(paragraphs 7 to 10 of Chapter II) :*

No general agreement is indicated to limitations of axle-loading to wheel diameter. There are indications that thought is being given to this and some Administrations have in mind a figure of 4.5 to 5 t (axle load) per foot of diameter (14.5 to 16.5 t per metre). Such figures may however place onerous restrictions on locomotive design.

There is no direct evidence that speed of electric traction, by itself, contributes to rail or tyre wear.

A divergence of practice on the use of articulated or non-articulated bogies exists but up to the year of review articulated bogies appear to be more favoured and some Administrations report reduced flange wear with them, provided that there is a centralising force provided at the bogie ends.

Severe rail corrugation is only reported by one Administration.

**Mr. Ivancević** (in French). — The last sentence of the first paragraph of Summary No. 3 :

« Such figures may however place serious restrictions on locomotive design » might very well in my opinion be omitted without affecting the wording of the summaries.

**The President.** — Mr. Cook, do you wish to say something ?

**Mr. Cook.** — I think it is proved that it is very difficult to increase the size of the wheel of the double-bogie locomotives above 4 ft., and that, of course, is linked up with the paragraph

we have previously considered of the general adoption of double-bogie type locomotives.

**Mr. Ivancević** (in French). — I repeated, I consider the sentence :

« Although no quantitative data have been given in this connection... » in the fifth paragraph of Chapter II should be suppressed, all the more so as this affirmation does not occur in the replies received, but would appear to be based on the knowledge of the Reporter.

**Mr. Squilbin** (in French). — The remark just made by Mr. IVANČEVIĆ refers to the text of Summary No. 2, which will be reviewed again at our next meeting.

**Mr. Ivancević** (in French). — No, to Chapter II, paragraph 5, or the first paragraph on p. 1379/55 (*Bulletin*, September 1958, French edition) (\*) where it says :

« Although no quantitative data have been given... »

**Mr. Squilbin** (in French). — It has been decided to review this paragraph during the next meeting.

**Mr. Ivancević** (in French). — It all links up with the rest of the summary, and we cannot adopt the following passage if we are not quite clear to begin with about the first point.

**The President.** — I think I am right in saying that the paragraph we are

---

(\*) Second paragraph of p. 1383/51 of the September 1958 *Bulletin* (English edition).

discussing contains facts which were reported to Mr. COOK and Mr. VIANI. There is one sentence: « Such figures may, however, place onerous restrictions on locomotive design », whether that was stated or not I do not know?

**Mr. Nouvion** (in French). — I am of the opinion that it should be retained, and it may even be thought that such figures will however lead — in fact certainly will lead — to serious restrictions in locomotive design. That is certain.

**The President.** — From the point of view of *British Railways*, I certainly agree. I do not think we ought to extend this revision any further than we can help, and it would seem right to say that paragraph 1 is an expression of fact, and unless there is some point in the revision of the previous paragraph which obviously affects this paragraph, then we should accept it. All right? Any other point in the next three paragraphs?

**Mr. Ravenet** (in French). — In the third paragraph of Summary No. 3, mention is made in the French text of « bogies articulés ».

I think this is an error in the translation, and to express the author's idea, we should say « bogies attelés ».

**Mr. Viani** (in French). — That is quite right.

**Mr. Ravenet** (in French). — However, there is one essential idea which appears to have been overlooked in this

paragraph, i.e. that there are limits to coupling the bogies. After a certain recentring force is exceeded additional wear is caused.

I suggest therefore replacing this paragraph by the following text:

« Certain Administrations report a reduction in the wear of the flanges on bogies in the case of bogies with an elastic connection between the inner headstocks.

« However, increasing the recentring force of the bogies beyond a certain limit increases the wear of the flanges. »

**Mr. Squilbin** (in French). — Would you retain the first sentence of the paragraph, Mr. RAVENET: « There are different practices... ».

**Mr. Ravenet** (in French). — It could be retained.

**Mr. Squilbin** (in French). — One fact was mentioned, and that is that coupled bogies are preferred.

**Mr. Ravenet** (in French). — I quite agree with that.

**Mr. Squilbin** (in French). — We will therefore retain that part.

**Mr. Ravenet** (in French). — Yes.

I would then prefer to replace the first sentence you just mentioned by the following sentence:

« The influence of the type of bogie, whether articulated or non-articulated, on the wear of the flanges is not clearly known. »



Then we would continue :

« Certain Administrations report... »

**Mr. Squilbin** (in French). — The complete French text will therefore be :

« The effect of the type of bogie (articulated or non-articulated) on the wear of the flanges is not clear.

« Certain Administrations report a reduction in the wear of the tyres with the use of bogies having an elastic link between their inner headstocks :

« However any increase in the re-centring force beyond a certain limit increases the wear of the flanges. »

**The President.** — Is that amendment agreeable ?

**Mr. Alström.** — There is in the English text only a very small thing I should like to have altered, and that is, it is stated through « centralising force », the two words. Then there is another thing, that is the foregoing paragraph where it is stated there is no direct evidence that speed of electric traction by itself contributes to rail or tyre wear. I would ask if this is a statement, but should it not be, there is no report that the higher speed of electric traction by itself gives higher rail or tyre wear. I think it should not be in the form it is now.

**Mr. Cook.** — There is very little difference.

**Mr. Alström.** — The speed of electric traction; I ask, what does it mean, the wear of tyre and rails and so on, should

be attributed to the forces on the locomotives and on the rails, but not to the traction form.

**The President.** — Mr. Cook, can you explain that sentence more clearly ? Perhaps there is no direct evidence of the increase of speed of electric traction as compared with Diesel or steam...

**Mr. Cook.** — The higher speed generally, that was the question that was asked and the answer is common knowledge. The higher speed of electric traction by itself does not increase tyre wear.

**The President.** — It means the increased speed. Would you like to include the word « increased » in front of speed to say the « increased average speed » ?

**Mr. Alström.** — That is the difference of maximum speed or minimum speed — average speed ?

**The President.** — Well, may I accept that with the amendment to this paragraph and the alterations to the third paragraph, the remainder of Summary No. 3, which Mr. Cook read out is adopted. (*Accepted.*)

We now pass to *Chapter III : Maintenance of traction motors.* Will you please read out the first part Mr. Cook ?

— *The final text of Summary No. 3 is worded as follows :*

« 3. No general agreement is indicated to limitations of axle-loading to wheel diameter. There are indications that

thought is being given to this and some Administrations have in mind a figure of 4.5 to 5 tons (axle load) per foot of diameter (14.5 to 16.5 t per metre). Such figures may however place onerous restrictions on locomotive design.

« There is no direct evidence that the increased average speed of electric traction, by itself, contributes to rail or tyre wear.

« There is no clear indication of the effect which the type of bogie (articulated or non-articulated) has on flange wear. Some Administrations report reduced flange wear with bogies having a centralising link between them. Any increase in recoil force beyond a certain limit, however, increases the amount of flange wear.

« Severe rail corrugation is only reported by one Administration. »

**Mr. Cook :**

*Summary No. 4  
(paragraphs 1 to 6 of Chapter III) :*

#### CHAPTER III.

##### Maintenance of traction motors.

Design of traction motors should enable long life to be obtained before commutators need to be dismantled for returning.

Mileages of 500 000 (800 000 km) should be obtained so that returning may not be necessary before the general repair stage of the locomotive is reached. There is a constant aim to make this mileage rise.

Attention is being given to the use of improved forms of insulation so that this will not cause a shortfall in life of traction motors.

There is division of opinion as to whether it is necessary to fit keys in armature shafts and pinions; the fitting of keys predominates.

It is universal practice to fit pinion on to shaft by shrinking on a taper.

Opinion is also divided concerning the desirability of keeping pinions and spur wheels mated.

**Mr. Martin** (in French). — In the French text it says :

« The design of the traction motors should ensure their long life before it becomes necessary to dismantle the commutators to remachine them. »

I do not think this wording is very satisfactory, and I suggest the following :

« The traction motors should be designed to obtain as high a mileage as possible before the commutators are re-turned. »

The second paragraph could also be simplified by simply putting :

« To avoid having to repair these parts before the general overhaul of the locomotive is due, these mileages should be of the order of 500 000 miles. »

I would also like to point out that on the modern electric locomotives of the S.N.C.F. we have now fixed the mileage between general overhauls at 1 200 000 km (747 000 miles) with merely an exchange of bogies every 600 000 km (373 000 miles).

**Mr. Cook.** — I do not think that I could quote the maximum but I felt one had to quote a reasonably high figure. I agree that there are higher figures still, but I do not believe that I can quote them at this time.

**Mr. Martin** (in French). — I am not asking for this figure to be mentioned at all. I simply gave it here for the sake of information, information which con-

firms the ideas and desires expressed by the Reporters. But, I repeat, I certainly am not asking for this figure to be included in the text of the general summaries.

**Mr. Alström.** — We could perhaps mention that for motors on direct current higher figures are given.

**The President.** — If that is required, we can easily say : « mileages of so and so or more ».

**Mr. Viani** (in French). — But if no figures are given, we might say : « ... for the longest possible mileages ».

**The President.** — Mr. Cook have you any comments on the amendment proposed by Mr. MARTIN ?

**Mr. Cook.** — No, the general trend of the paragraph is the desire to have a fairly high figure in view. I thought the figure of half a million, while there are exceptions, might be criticised as too high as a general statement.

**The President.** — Will it cover the points by putting in « or more » ?

**Mr. Martin** (in French). — We can leave the last sentence suggested by the Reporters : « there is a constant tendency to increase this mileage ».

**Mr. Squilbin** (in French). — I think it is a useful statement.

**The President.** — Are there any other points ? The Reporters have accepted

the proposal by Mr. MARTIN. Any other points on the remainder of the summary ?

**Mr. Ravenet** (in French). — Mr. President, as far as the third paragraph is concerned, it says :

« Particular attention is paid to the use of improved insulating methods to avoid any reduction in the life of the traction motors. »

I do not think this completely reflects the point of view of the Reporters. Moreover, modern insulating materials have two distinct functions. They are either used on modern motors from the time they were made to obtain high performances, or — and this is their second function — on old motors, not in order to increase their performance, but to prolong their life.

I think these two ideas might usefully be included in the summaries.

For this reason, I suggest replacing the present paragraph by the following text :

« The use of modern insulating materials allows, on the one hand, the designing of new motors with a very high power weight and, on the other hand, the prolonging of the life of old motors. »

(*Sign of agreement* from the Special Reporter.)

**The President.** — Do you agree with that ? (*Agreed.*) Any other points on the other two paragraphs ?

**Mr. Athanasov**, Ministry of Communications and Transport, Bulgaria (in



*French*). — May I ask the French delegate a question?

To what kind of insulating materials does this refer?

**Mr. Ravenet** (in French). — They are class H or F insulating materials. If you would like, we can discuss this at the end of the meeting.

**Mr. Ivancević** (in French). — I suggest adding that modern insulating materials are also used with old motors to increase their power.

**Mr. Cook.** — I do not think it has reached that general state yet. It may have in certain places, but not generally.

**The President.** — Any other comments?

**Mr. Nouvion** (in French). — In the fourth paragraph it says: « ... the use of keys predominates... ».

I think it can be said that it predominates if all the old types are taken into account.

In the case of motors built in France during the last ten years there are no keys. This obviously presupposes a sufficiently large pinion compared with the shaft. But the same requirement holds good when there is a key. The suppression of the latter makes it possible to reduce both the cost of the motor and the cost of its maintenance.

Finally, it is very easy to withdraw a pinion without a key by oil pressure, which is practically impossible if there is a key.

It is therefore only in the case of

pinions which are too small to allow of the transmission of the torque by pressing on the pinion with a sufficient coefficient of safety that a safety key is still necessary; but as it is impossible to fit it according to the classical arrangement on the generatrix of the cone owing to the insufficient thickness of the pinion, it must be attempted to put the key at the end of the motor shaft to hold the pinion, prevent it becoming loose and the motor racing. But as a general rule, keys have been suppressed as far as we are concerned.

Therefore I suggest the following wording:

« Opinions are divided concerning the need to use keys for fixing the pinion on the armature shaft; the use of keys predominates on old types of motors, but shrinking on without keys tends to become the general practice on modern motors. »

**The President.** — Mr. Cook, would you agree with this text?

**Mr. Cook.** — I do not know, it is clearly borne out in the reports, that there is not a clearly defined practice at the moment. I would prefer the present wording.

**Mr. Nouvion** (in French). — I suggested a new wording to reply to a point raised just now by Mr. ROBERTSON who asked: « what should we do in the future? ». In my opinion, keys must not be used in the future.

**The President.** — You use the words « tendency of new designs and modern

practice ». Would there be general agreement on that? We ought to put that point in, which I think is probably right.

*(Signs of general agreement by hands up.)*

I think the general feeling is that we ought to put in the « tendency without keys ». Thank you. I believe we have covered every paragraph in Summary No. 4, so that I will ask Mr. Cook to go on with the next summary.

— *Summary No. 4 is adopted with the following wording :*

**« Maintenance of traction motors.**

« 4. Design of traction motors should enable as high a mileage as possible to be obtained before commutators are re-turned. Mileages of 500 000 (800 000 km) should be obtained so that re-turning may not be necessary before the general repair stage of the locomotive is reached. There is a constant aim to make this mileage rise.

« The use of modern insulating materials allows, on one hand, the design of new motors with a higher power in relation to volume and on the other hand, an increase in the life of existing types of motors.

« There is division of opinion as to whether it is necessary to fit keys in armature shafts and pinions; the fitting of keys predominates on older types of motors but there is a tendency to eliminate keys in new types.

« It is universal practice to fit pinion on to shaft by shrinking on a taper.

« Opinion is also divided concerning

the desirability of keeping pinions and spur wheels mated. »

**Mr. Cook :**

*Summary No. 5*

*(paragraph 7 of Chapter III) :*

Flashovers on electric locomotives appear to be rare and when they do occur, are generally caused by frost and snow, contamination by smoke, dust and exhaust from steam locomotives or by lightning.

There are, however, varying devices to assist in current collection :

- use of two pantographs or one pantograph with two shoes to reduce current collection per pan or pantograph;
- provision of two or more collecting strips on each shoe;
- improvement of the general design of the pantograph including provision of auxiliary springs to help shoe to follow the wire and of air vanes on high speed locomotives to keep shoe level;
- fitting of arrestors on locomotives to limit surges caused by lightning;
- instructions to train crews to limit current and fine division of resistances to assist in this;
- in a few cases, fitting of separate wheel slip indicators, but crews are also taught to reduce this from armature field meters;
- provision of arcing horns to prevent burning of commutator bars when flashover does occur;
- provision of high speed breakers with lower overload in place of fuses so that the current can be quickly restored after the flashover has occurred.

**Mr. Picard, French National Railways** (in French). — The Reporter begins with the sentence :

« Flashovers on electric locomotives » appear to be rare.

Possibly, the whole of the proposed text is somewhat long for dealing with a fact, which from the beginning, seemed to be only of secondary importance.

**The President.** — The point is, I think the paragraph is out of proportion to its importance as a matter for discussion.

**Mr. Cook.** — It was definitely item 3 of the remit. It was a very definite thing and although it is correct that they are rare, they spring from a variety of causes and there are certain methods, things to be avoided if possible and it is very difficult to give the methods by which endeavours are made to eliminate them without quoting a number of definite points. It is more reading matter perhaps than some others but I have difficulty in condensing it unless a decision is agreed to eliminate it altogether and then it does not agree with the remit.

**The President.** — Is there any other delegate who considers the impression is given by the size of the text that « flashovers » are more important to the Administrations than they are? Some attempt should be made to give a shorter text, a precis.

**Mr. Maass.** — While supporting in a manner the view expressed by the delegate of the French Railways, I think their experience is well-known, I would support the view of the Reporter, we should maintain or retain the sentences which follow the opening sentence.

**The President.** — Any other comments on this point?

**Mr. Ebeling, International Railway Union (O.R.E.).** — I want to add

something for the second paragraph, you have given the wording « provision of two or more collecting strips on each shoe » I would propose to divide this into two parts because there is a different utilisation of contact strips for alternating current and for direct current. This sentence only is right for the D.C. system, but not for the A.C. system where we have a high tension and a light overhead line. Therefore we must look for light pans. The tendency on new constructions is given by the results of a large number of tests we have made. The A.C. pantograph is recommended to have 2 shoes with only one contact strip. I would propose to give a different explanation of this sentence for A.C. and D.C.

**Mr. Cook.** — I would have no objection to Mr. EBELING's remark. I think these measures have to be understood as applicable in different cases. If it is desired, we could add after « each shoe » D.C. system.

**The President.** — Any other comments?

**Mr. Ebeling.** — Commenting on the whole, I would say that most electric traction use the A.C. system and, therefore, I would propose to mention also the tendency of the A.C. system.

**The President.** — We propose to draft this paragraph after the meeting.

**Mr. Alström.** — I wonder if the difference between D.C. and A.C. systems is really sufficiently stated on the ques-



tion of the shoes, and if the Reporter has more in the records from the various Administrations regarding flashovers, and if the question of flashover is more severe by D.C. than by A.C., I think it should be said.

**Mr. Cook.** — Does that call for any alteration, Mr. President ?

**The President.** — The proposal is to put in an introduction that « with A.C. it is likely to be less than with D.C. ». Have you any evidence ? I think there is perhaps a word to be altered first of all, whether « rare » should be modified to « not very frequent ». What do you propose ?

**Mr. Cook.** — I think that « flashovers are not very frequent » would be the better wording.

**The President.** — What is your idea on bringing in the A.C. and D.C. comparison ?

**Mr. Cook.** — The figures are appreciable, the C.F.F. had one even 20 000 miles.

**The President.** — Well, now we know that point, we shall have to insert another piece in that chapter. We have to re-draft those first few words.

**Mr. Ebeling.** — If you are going to revise this text, the last paragraph also speaks about the D.C. provision of safety speed breakers with lower overload so that the current can be quickly restored. You recommend to install breakers with lower overhead breaking possibility.

That is not right in regard to A.C. locomotives. In this case, the normal construction is to have a breaker with a high load capacity to avoid a break in the sub-station. There are very different situations in the two systems and I think that must be divided.

**Mr. Cook.** — This rather suggests increasing the wording of the section, although earlier discussion rather indicated an opinion that it was much too long.

**The President.** — I am aware of that, either we revise this and make it longer or we very much revise it. I see Mr. NOUVION would like to say something.

**Mr. Nouvion** (in French). — I suggest deleting « small overload ».

In effect, whether it is a case of D.C. or A.C. traction, there is no value in keeping the current on the motor when there is a flashover.

I think we might simply say : « ... ultra-rapid circuit breakers instead of fuses... » which would meet the case both with D.C. and A.C.

**Mr. Ebeling.** — I agree.

**The President.** — The point is, are we keeping the whole of this text and extending it as a number of delegates think it should be done, or are we trying to do the exact opposite and shorten it ?

**Mr. Martin** (in French). — In support of what Mr. PICARD said just now, I do not think the text should be lengthened as I think it is already too long.

In any case, if all the ideas expressed are to be retained, they must be given more systematically.

In effect, the preventative steps in my opinion relate to four categories of things :

- current collection;
- design of the motors;
- design of the protective equipment;
- method of driving.

I think it would be amply sufficient just to mention these four headings. But if you wish to go into further details, I will not oppose it.

**The President.** — I think probably it would be desirable to shorten this if we can. May I suggest that we prepare a revised paragraph which contains the information in a shortened way and present it at the next meeting ?

**Mr. Ivančević** (in French). — I agree, but I would like to make yet another suggestion.

It says in the last sentence of the first paragraph : « There are however different methods for facilitating the pick-up of the current ».

In my opinion the Special Reporter has somewhat modified the meaning of the sentence in the questionnaire which says : « Causes of flashover and steps taken to prevent it... » and consequently the meaning of the replies.

A more suitable formula for the summary, agreeing with Mr. VIANI's report on p. 895/51 (p. 1060/40, *Bulletin* for July 1958, English edition), where he speaks of the causes of flashover and

the steps to be taken, completed by certain data from these conclusions, would better correspond to the object of our summaries.

**The President.** — Mr. IVANČEVIĆ could see me afterwards on that point with Mr. Cook. May I suggest it is that point which deals with the revision we are talking about. I think at the same time that what we should do is to take these remarks and deal with them in the revision of the text. As stated the revised text will be submitted to you at the next meeting.

**Mr. Alström.** — There is in the last paragraph about the records of roller bearings. We were asked a question saying : « Have you found that cracks occur in the axles when you fit roller bearings ? » and we answered « No », and now we find it stated there have been no replies received on roller bearings for axle suspension of nose-suspended motors. We have nose-suspended motors with roller bearings but without cracks in axles.

**Mr. Cook.** — We were just going to read this paragraph (*paragraph 8 of Chapter III*), worded as follows :

No reports have been received of the use of roller bearings for axle suspension of nose suspended motors.

I think Mr. President, that there might be some criticism of that but in general that represents the replies we received.

**Mr. Alström.** — It is a fact that at least one Administration is using roller

bearings for axle suspension of nose-suspended motors. I think it would be advisable to eliminate also this part of the report, not say anything about it.

This sentence should be completed; it should be added that it is question of armature roller bearings, which is not made.

**Mr. Cook.** — I think, Mr. President, perhaps the replies received have been deduced incorrectly, it has come indirectly from some other information and I must agree that it might be better to eliminate it.

**Mr. Cook.** — No, I think most armature bearings are not generally roller bearings.

**The President.** — Mr. Cook, can you say, « including roller bearings ».

**The President.** — Well, it would not do any harm to do it, as it does not tell us very much. (*Signs of assent.*)

May we have the *Chapter* on lubricants, please ?

**Mr. Cook.** — I think so.

**The President.** — Any other point on that ? Then, I declare Summary No. 6 accepted subject to the amendment of the first sentence.

**Mr. Cook :**

*Summary No. 6 (Chapter IV) :*

#### CHAPTER IV.

##### Lubricants.

Grease lubrication is used generally in traction motor armature bearings.

Both grease and oil are used in axle or hollow shaft bearings.

Different characteristics are specified in lubricants to meet seasonal changes of temperature but generally this becomes a gradual change towards the desired properties by addition rather than complete changes.

Heavy grease or gear compound is used universally in traction motor gears.

No reports of the use of new lubricants (bisulphide of molybdenum or lithium) have been received.

— *The text adopted is worded as follows :*

##### « Lubricants.

« 6. Grease lubrication is used generally in traction motor armature roller bearings.

« Both grease and oil are used in axle or hollow shaft bearings.

« Different characteristics are specified in lubricants to meet seasonal changes of temperature but generally this becomes a gradual change towards the desired properties by addition rather than complete changes.

« Heavy grease or gear compound is used universally in traction motor gear.

« No reports of the use of new lubricants (bisulphide of molybdenum or lithium) have been received. »

**The President.** — Any comments on this text ?

**Mr. Ivancević** (in French). — In the first paragraph of this chapter, it is stated that the armature bearings are generally lubricated with grease.



**Mr. Cook :**

*Summary No. 7 (Chapter V) :*

#### CHAPTER V.

##### **Wear on the pantograph strips.**

Pantograph strips most generally used are flat strips of copper, aluminium copper, cadmium copper or copper bearing steel but there is a tendency to a more general use of carbon.

Graphite grease is the most usual lubricant. It can be applied quickly and easily and is effective.

When pantograph strips are worn, it is usual to change pans.

For a given material, strip life varies considerably, being influenced by climatic and atmospheric conditions and by speed and type of service.

Upward pressure of pantograph is generally specified to be between 16 and 20 lbs. (7 and 9 kg).

**The President.** — Any comments ?

**Mr. Ivancević** (in French). — At the end of the first paragraph it says : « ... but there is a tendency to a more general use of carbon ».

From the replies received, it is not possible to formulate such a summary concerning the wear of the pantograph strips.

In effect, of the twenty-four Administrations who sent a reply to the Congress, twelve are in favour of using copper; eight favoured carbon and the other four alloys or other materials.

I think this state of affairs should be stressed here.

**Mr. Cook.** — Yes, that is possibly correct.

**The President.** — If it is correct, I think it ought to be amended.

**Mr. Cook.** — The text reported the position in the year under review. It may or may not be correct to-day. I think it is right to say there is now a more general tendency but it is open to some argument.

**The President.** — Yes.

**Mr. Ebeling.** — I want to make a remark on the same chapter but regarding the first paragraph. My proposal was, contrary to Mr. IVANCEVIĆ, to add after, the « use of carbon » : « and metallic carbon » because of newer experience. We have made in this matter a lot of tests on a special testing machine also with metallic carbon and found that some sorts of metallic carbon have the best qualities on D.C. system. Strips of metallic carbon stay longer than strips of pure carbon. It is also the experience of officers from the different Administrations that more and more strips of carbon and metallized carbon are used. I suggest what Mr. Cook has said is right to mention strips of carbon and metallized carbon too.

**Mr. Ravenet** (in French). — I quite agree with what Mr. EBELING has just said. However, I think there is one slight reservation that should be made.

In effect, the use of carbon is tending to become general, except at very high speeds, as it appears to make the head of the pantograph somewhat too heavy.

**Mr. Ebeling.** — I agree with this remark but I must say that also depends on the type of current used. With D.C. the current is sometimes more than ten times higher than on A.C. You are

right on the D.C., but one must not forget the A.C., which can be the system of the future, and therefore we must mention the most suitable material for the A.C.

**Mr. Ivancević** (in French). — I do not agree with Mr. Ebeling. Our researches and experience show in fact that with copper and carbonised copper you can get the same results as with carbon.

Consequently, I suggest deleting : « ... but there is a tendency... ».

**Mr. Ebeling.** — I do not agree with Mr. IVANCEVIĆ because the research is not made only on test, it is also made by experience and observation on the line. There is a large number of Administrations which have given the results and it is not only laboratory work, but also results on the line. I would propose to let the wording « but there is a tendency to a more general use of carbon » and to add « and metallised carbon ».

**The President.** — « Recent experience and trials have shown that... », and that may possibly satisfy Mr. IVANCEVIĆ. Are there any other points on this summary.

**Mr. Ebeling.** — In the fourth paragraph, of this chapter you have given « strip life varies considerably, being influenced by climatic and atmospheric conditions and by speed and type of service ». I would propose to add here « and pressure of the pantograph » as it is also mentioned in the report of

Mr. Cook. This pantograph pressure is very important for the wear of the pantograph. Further I propose to add between the words « upward » and « pressure », the word « static » in the last sentence of this chapter.

**The President.** — Agreed.

**The President.** — Subject to that amendment, any other point? I declare the summary approved subject to the amendment agreed. Gentlemen, that concludes the meeting today, so we do not meet again until Monday October 6, at 9.30 a.m.

— *The text adopted for Summary No. 7 is worded as follows:*

**« Wear on the pantograph strips.**

« 7. Pantograph strips most generally used are flat strips of copper, aluminium copper, cadmium copper or copper bearing steel but there is a tendency to a more general use of carbon.

« Recent experience and trials have shown a tendency towards more general use of carbon and metallized carbon.

« Graphite grease is the most usual lubricant. It can be applied quickly and easily and is effective.

« When pantograph strips are worn, it is usual to change pans.

« For a given material, strip life varies considerably, being influenced by climatic and atmospheric conditions, speed, type of service and pantograph pressure.

« Upward static pressure of pantograph is generally specified to be between 16 and 20 lb. (7 and 9 kg). »

— *The meeting ended at 1 p.m.*

## Meeting of the 6th October 1958.

PRESIDENT : J. RATTER.

**The President.** — Ladies and Gentlemen, you have in front of you two proposed amended texts for Summaries Nos. 2 and 5, and we will take these first. The other amendments have already appeared in the *Daily Journal*. I will ask Mr. Cook to start with Summary No. 2 which has been altered to take into account the comments made during our first session.

**Mr. Cook :**

*Summary No. 2 :*

« 2. The amounts of wear permitted for tyres vary somewhat between the Administrations and are based mainly on experience. Practical and theoretical studies to determine better limiting profiles are being pursued.

« Some Administrations have so far used only nose suspended motors; others have also used fully suspended motors.

« It has not been possible to establish any definite relationship between motor suspension systems and wear on tyre or rail. Whereas fully suspended motors have been adopted principally for the advantages gained in the working conditions of the motors themselves, it is also anticipated that the reduction in unsprung weight will result in an improvement in the life of tyres and rails.

« Practically all new electric locomotives are being constructed in the double bogie designs which limit wheel

diameter to a maximum of about 4 feet (1.250 m). This does no doubt increase tyre wear and rail end hammering, although there are no quantitative effects to report but it is considered that these drawbacks are largely compensated by the advantage of total adhesion of the locomotive.

« Tyre wear does not vary in any relationship to its machined diameter within the overall variation permitted between maximum and minimum thickness. »

**The President.** — Are there any points affecting the new text? We hope we have covered all the points raised at the last meeting (*Signs of assent.*) Very well, we will pass on to Summary No. 5. This has been considerably shortened but the small sub-committee which discussed this matter felt that as there had been details in the text of all the reports, it might perhaps be better to refer to them and shorten this summary accordingly. Perhaps Mr. Cook you would read it out.

**Mr. Cook :**

*Summary No. 5 :*

« 5. Flashovers on electric locomotives are rare. They are generally caused by frost and snow, contamination by smoke, dust and exhaust from steam locomotives or by lightning.



« The preventative measures which are detailed in the reports, concern briefly :

- « — current collection;
- « — design of motors;
- « — design of protective equipment;
- « — design of control gear and driving technique. »

**The President.** — Any comments on that? No comments, then I declare that summary also adopted.

We then go on to the last three chapters. First, *Chapter VI: Organisation of maintenance and periodicity.*

#### CHAPTER VI.

##### Organisation of maintenance and periodicity.

Electric locomotives are expected to run large mileages of the order of 500 000 miles (800 000 km) over a period of 4 to 5 years before requiring complete overhaul.

Daily inspections are of a very minor nature when they are carried out and it is normal to carry out depot inspections at intervals of 7 to 21 days.

Three principal components which may govern periods between depot inspections are pantographs, brake blocks and tyres.

Change of bogie at Works forms the quickest method of releasing locomotives for further service when tyres are worn to the limit.

Some Administrations replace heavy flange wear of tyres by deposition of weld metal without any subsequent machining.

**The President.** — What comments are there?

**Mr. Watkins, British Transport Commission.** — The paragraph: « Change of bogie at Works forms the quickest method of releasing locomotives for further service when tyres are worn to

the limit », I would like to know what it means by « Works ». The reason I raise this is from the operating aspect. I am thinking it is desirable to have the locomotive back as quickly as you can, and has thought been given to change the bogie at the running sheds rather than run them back to the Works which takes a long time?

**Mr. Cook.** — I think there are about four points which arise on the matter. The first is the necessity for giving attention to the tyres can nearly always be foreseen, it is generally not a sudden development. To change bogies at M.P. depots entails the provision of very heavy lifting equipment at M.P. depots, certainly not less than 30 tons, in addition there is the subsequent despatch to and from the Works of the bogie for repair and back. We would get it back much more quickly by having it done at the main Works and the bogie could be again renovated for further use, the great point being that it is possible to send a locomotive to its works in time for attention to be given for tyres and then it should only be a matter of a few hours before release.

**Mr. Martin (in French).** — Mr. President, I fully share Mr. WATKIN's opinion. For my part, I think that it is, on the contrary, as far as possible, desirable to see that the work of changing bogies can be done in the sheds in such a way as to allow of the return of the locomotive into service as quickly as possible.

Consequently, I suggest deleting the words « in the works ».

**Mr. Cook.** — I am quite agreeable to that, Mr. President.

**Mr. Watkins.** — My main point is that I agree, except does this form the quickest method. It obviously does not, it is not the quickest but it might be the most convenient.

**M. Martin** (in French). — Again I fully agree with Mr. WATKINS.

In effect, I consider exchanging bogies a valuable operation, but undoubtedly it is not the fastest possible operation nor the least laborious way of keeping the locomotive in service.

The fastest operation is to make use of a reprofiling track lathe and reprofile the tyres without removing the axles.

In France, we have installed very simple reprofiling track lathes at several of our depots, which have given complete satisfaction.

I would like to add that, on a more general plane, owing to the improvements in construction of modern stock, and also to a lesser extent, of the older stock, both as regards the electrical equipment and the mechanical equipment, there is an ever growing difference in the periodicity of maintenance for the locomotive as a whole and the maintenance of the wheels.

It is therefore not only essential, but also extremely valuable to have available equipment allowing of the reprofiling of the tyres of the motor axles of locomotives « in situ », when this has to be done outside the periodical overhaul of the other parts of the locomotive.

**Mr. Cook.** — I agree that perhaps in total the quickest method is by reforming in position. I do not think any indications were received from Administrations that they are doing that yet on electric locomotives. It is mentioned in the text and I thought in the summary but I do not see it. It is mentioned in the text that Administrations are contemplating doing it, it forms one method under certain circumstances but not always. I would be quite agreeable to alter the summary by deleting « at Works » and I think add « or by reforming ' in situ ' by a suitable machine »

**Mr. Martin** (in French). — For this reason, Mr. President, if you are agreeable I suggest replacing the paragraph we are discussing by the following text :

« A change of bogies or the use of a track reprofiling lathe, without removal of the axles, makes it possible to put back into service very quickly any locomotive whose tyres show signs of wear », which is perhaps rather more general a term than « at limit of wear ».

**Mr. Sykes**, *British Railways*. — I suggest the wording « when the tyres require attention ».

**Mr. Cook.** — I prefer : « reprofiling ».

**Mr. da Cunha Monteiro**, *Portuguese Railways*. — I would like to call your attention to the last paragraph as while the question was discussed, I think that it has been decided to leave out the reference to the possibility of rebuilding the tyre flange by means of welding

because such method has not been generalized and is not proved to be safe. I think this should be taken into account in the paragraph referring to « Some Administrations... ». We did not mention it in Summary No. 3 and we should not mention it now.

**The President.** — May I suggest we come to that point in a moment. May we first agree the text of the previous paragraph. We want to be quite sure of the English text. Perhaps whilst we are trying to do this you would like to say something.

**Mr. Cook.** — Mr. President, the reference which was made to the practice of welding of flanges in the previous text was a matter of emphasis, it was considered by some delegates that it was too strong in that position and we agreed, but this is a fact which is reported, and I do not see it has undue prominence in this form. I think it should be retained.

**The President.** — I wonder would it help if instead of saying « some » we said « a few », « some » may mean a large number.

**Mr. Ravenet.** — Agreed.

**Mr. Martin.** — A small number.

**The President.** — The words « Some Administrations » may give an impression there are quite a large number, let us say « a few » instead of « some ». Does that help you ?

**Mr. da Cunha Monteiro.** — Yes.

**The President.** — Let us pass to the amendment to paragraph 4.

**Mr. Cook :**

« A change of bogie or the use of reprofiling equipment without removal of the wheels from under the locomotive allows the rapid return of the locomotive to service when the tyres require reprofiling. »

**Mr. Squilbin** read out the French text and stated that the last part of the sentence had been altered as requested by Mr. SYKES.

**Mr. Martin** (in French). — I am in complete agreement with it.

**Mr. Watkins.** — But you do not say, Mr. President, how it should be done. It must mean either at main Works or Depots, why don't you put in where ?

**Mr. Cook.** — I think it should be left open. It may depend considerably on circumstances, geographical or otherwise.

**The President.** — We could say : « either at main Works or at running Depots », would that suit you ?

**Mr. Watkins.** — Yes.

**Mr. Martin** (in French). — I think, Mr. President, that the actual definition of shops and depots varies considerably from one Administration to another, and it seems to me that it would be difficult to be very definite about a matter which



should be quite easily understood by everyone.

**Mr. Maass.** — One point arises out of this discussion, the use of reprofiling equipment. Profiling equipment is a comparatively new technique which is followed. Have we the assurance from the French delegates that it is the practice we should recommend. Is that a good thing we are now saying that it is necessary? Has the reporter got that information, anything to make a definite recommendation?

**Mr. Cook.** — I think that it is brought out clearly in the report itself. It is correct to say there are no reports of this equipment being used on electric locomotives but we do know it is used very successfully on Diesel locomotives and it could clearly be adapted from that within its limits on electric locomotives.

**Mr. Ravenet** (in French). — To give further precision to the reply given by the French railways to the Reporter, I would like to say that we have, at the present time, two reprofiling equipments working; another will be put into service this month, and four others are on order.

During the course of last year, on the single machine in the Paris region, we made good the wheels of 800 locomotives.

I think we have now gone past the trial stage, into that of practical experience.

**The President.** — I think a good many of us know many of those equip-

ments are in use in the U.S.A. and quite a large number of us who have been in the U.S.A. know they are giving perfectly good service. Do you agree with that Mr. MAASS?

**Mr. Maass.** — Yes, the only reason I raised this was to draw attention to the fact that we are discussing the current practice, we are considering the report and facts brought out in the discussion that the tendency is for the reprofiling machines to be used and this has now been done.

**The President.** — Has the point now been cleared, as to whether we specify workshops or not?

**Mr. Watkins.** — I prefer to leave it out, as long as it does not say « Works » it does not matter.

**The President.** — It leaves that open and it must be speaking either of main works or running sheds, that will satisfy you? Thank you, in that case, are there any other points on the remainder of the chapter?

**Mr. Koster.** — Referring to the figures given in the first paragraph about mileage between general overhauls, I should like to know what is meant by a « general overhaul »?

**Mr. Cook.** — I think examples are given. A general overhaul would require some definition, it means in total a complete stripping down of all the equipment on the locomotive and repair according to necessity as shown by tests and examination.

**The President.** — It is defined on p. 1378 of the English text. Is there anything you would like to have added or altered Mr. KOSTER?

**Mr. Koster.** — There is a definition in the French text, p. 909, of Mr. VIANI'S report (\*), but in view of that definition I think the mileage given is rather low.

**Mr. Cook.** — I do not think it is a thing we can define in a very short space of time. I think a general repair is fairly clearly understood. There will be degrees in the extent of dismantling for testing and examination.

**The President.** — Mr. KOSTER'S point is really that 500 000 miles is low. Would it be fair to say 500 000 miles is a minimum figure?

**Mr. Koster.** — At present we have a minimum figure of 750 000 miles and we are aiming at 800 000 miles.

**The President.** — This text could be meant to mean the average per year is about 100 000 miles which I hope is a low figure, therefore, would it meet Mr. KOSTER'S point to say « in the order of at least 500 000 miles »?

**Mr. Cook.** — It is very largely on account of different conditions and it is brought out in the text. As reported, the average mileage of electric locomotives per annum is lower than one

would expect, there are a few Administrations with longer runs and under suitable circumstances where the annual mileage becomes much higher but I do not think one can give a really average expectation of more than half-a-million miles. As far as hopes are concerned « the sky is the limit ».

**The President.** — I see.

**Mr. Alström.** — I would ask if it is not necessary to show the difference between the different track systems. We have at least three principal systems, D.C., A.C. with D.C. traction type motors, and the A.C. system with A.C. traction motors. For the last system, I cannot think that we are different, and other Administrations could give figures of the order of at least 500 000 miles between general overhauls. I think D.C. could be right at 500 000 miles but for the A.C. system with A.C. motors it is not possible.

**Mr. Nouvion** (in French). — We have all three types of traction mentioned by Mr. ALSTRÖM and I can tell you it is exactly the same with each of them. We have the same maintenance periods with A.C. or single phase traction, whether with commutator motors or rectifiers. It is exactly the same, we make no distinction. In fact, we increase the periods between inspections for any type of motor.

**Mr. Gerber** (in French). — I think that the overhaul cycle depends in the first place on the age of the locomotives. We have some locomotives — proto-

---

(\*) *Bulletin* for July 1958, p. 1074/62, English edition.

types — which are now 40 years old, which have to be overhauled every 350 000 km (218 000 miles) and modern locomotives with which the general overhauls only take place every 1 200 000 km (746 000 miles).

These latter locomotives require very little work when undergoing overhaul, whereas the original locomotives involve a great deal.

For this reason I think the text should be left as it is.

**Mr. Alström.** — Of course, I agree that where there are great distances and there is a difference between old locomotives and the new ones, for example, we are obtaining 800 000 km with the new locomotives but it is also a question of the type of service. We have our locomotives utilised to a very high figure, very efficient utilisation, we have not such very long and steep gradients as in other countries, for example Switzerland. We can use fairly small locomotives with an efficiency of 350 HP for moving express trains of 650 tons and we can use also for the same service locomotives of 2 500 HP. I think the question of overhaul is also equally attributed to the designer of the locomotive, the utilisation, how hard it has to work and so on, and therefore the figures must vary very much between the various Administrations and various countries.

**Mr. Nouvion** (in French). — To return to what **SIR ROBERTSON** said, I think we should look towards the future and not towards the past.

**Mr. Picard** (in French). — In view of all that has been said about this matter, I suggest maintaining the Special Reporter's text and adding the following sentence :

« Certain Administrations report still higher mileages with modern stock. »

**Mr. Cook.** — Yes, I do not think we can put in figures any higher than this, as a whole, but as I said attempt the highest figure.

**The President.** — I think this will meet the discussion. Any other point ? We can accept.

**Mr. Maass.** — How are we going to describe the modern equipment. Modern design or old locomotives with *modern equipment* ? We want to get that clear.

**The President.** — Perhaps, it would be better to say « new locomotives » rather than « modern equipment ».

**Mr. da Cunha Monteiro.** — Modern design.

**The President.** — « New locomotives » sums it up best do you think ? That concludes paragraph one. Have you a point on paragraph 2 ?

**Mr. Ravenet** (in French). — In the second paragraph it says :

« ... it is the usual practice to carry out depot inspections at intervals of seven to twenty-one days. »

These periods of seven and twenty-



one days, mentioned in the summary for depot inspections appear to reflect very poorly the great possibilities of electric traction.

Such depot inspections are more usually carried out at intervals of one month or so, and I suggest that this be mentioned in the text.

**Mr. Cook.** — One might have a discussion on the actual number of days. There may be cases where it goes to a month but not very many, but when the period of the full routine inspection is extended to something like a month, there is generally a small inspection or inspections in between.

**Mr. Ravenet** (in French). — Our periods are forty-five to sixty days, and no minor inspections take place between them.

That was why I suggested an interval of one month as a compromise.

**The President.** — I think it is right to say, Mr. Cook, that some Administrations carry out inspection every seven days.

**Mr. Cook.** — Yes.

**Mr. Sykes.** — I think here again it may be a question of definition of « light inspection », and not as stated of « brake blocking » which so far as I am concerned, governs the periods at which the locomotive has to go into depot.

**Mr. Cook.** — That is the picture which arises in the paragraph immediately

below and that was brought out, one of the things which sets the period is there is no daily examination.

**The President.** — Do you agree, Mr. Cook.

**Mr. Cook.** — That is agreed, but it depends on the organisation if there is no examination whatever outside the depot; then, it is not surprising that there is an examination in the depot at something like seven days, but if the running gear is being attended to outside it is in fact a short period inspection.

**Mr. Ravenet** (in French). — In practice, in France, we do not include the replacement of brake shoes, which need not be done in a shed.

**Mr. Martin** (in French). — On p. 1377 of the *Special Report* (English edition), referring to these inspection cycles, there is a list of certain Administrations :

— Three of them carry out daily inspections. We will not deal with these which, as the report says, are very cursory ones;

— One Administration — the British Railways — inspects every seven days;

— All the others — and some of those not mentioned like the S.N.C.F. — inspect at intervals varying between fourteen — mostly twenty-five — and thirty-five days.

**Mr. Cook.** — I think they must be taken as complementary, the longer

period without other in between inspection is twenty-five days. Where it is longer than that, there are one or more minor inspections between.

**Mr. Martin** (in French). — I quite agree. There is some daily inspection. This is dealt with moreover in the summary since it says :

« Daily inspections, when these are carried out, are of a very minor nature... »

**The President.** — The difficulty is the nature of the inspection varies. Mr. Cook would you like to propose some amendment to cover this point to say daily or weekly or of a minor nature when they are carried out but the average period between depot inspections is twenty — twenty-eight days, or something of that kind. Would that be helpful ?

**Mr. Cook.** — The danger is to put in a wrong figure which will be read as absolute, that there is nothing whatever done in between, and I think it very dangerous if we put that in, giving to locomotives a very long period because I do not think it applies.

**The President.** — What do you suggest to cover the discussion ?

**Mr. Cook.** — Personally, I think it is covered in that paragraph in general terms.

**Mr. Julien, Ministry of Public Works and Transport, France** (in French). — I suggest simply saying at the end of the paragraph :

« ... at very varying intervals according to the Administrations (from seven to thirty-five days). »

**The President.** — An alternative would be to put in seven to forty-five days, according to the nature of the inspection.

**Mr. Maass.** — Inspection and service; service, that is the work the locomotive has to do.

**The President.** — Would that meet the point ? Do you think there is evidence that there is a difference in the type of inspection carried out ?

**Mr. Cook.** — The important point emerges every time in this discussion as to what is done, but I must reiterate the point, before we put down the figure that it should be one within which nothing whatever is done or examined.

**The President.** — If we were to say that at intervals of seven to forty-five days, or whatever the maximum is according to the type of inspection and the service of the locomotive, it does, I think, cover your point and also covers the discussion.

**Mr. da Cunha Monteiro.** — In this way, you can keep the next paragraph, otherwise you will have to change it.

**The President.** — Subject to that addition, which seems to meet the views of those delegates who have taken part in the discussion. Does that meet your point, Mr. KOSTER.

**Mr. Koster.** — Yes.

**Mr. Cook.** — Are we putting in seven to forty-five days?

**The President.** — What is the maximum number of days we have got in the text, thirty-five? I think Mr. RAVENET said forty-five days.

**Mr. Martin** (in French). — In our reply to the Reporter, we have said: « The period between inspections varies from forty-five to sixty days ». We have, however, no objection to mention forty-five days.

**Mr. Alström.** — From information I have, we are performing three different sorts of inspection, the first at intervals of thirty days, the second after another thirty days and the third after another thirty days, they are of different nature and we, therefore, have a type of inspection we perform every ninety days.

**The President.** — It seems to me the only way to cover this is seven to forty-five days, the limits we have really got out of this discussion and leave it like that. Would that be agreed to put seven to forty-five days, subject to the addition of a sentence which we have already agreed?

If there is no further discussion, I think we should accept this and pass on to the next summary. We have covered very fully the first and second paragraphs and if there are no more points on the chapter « Organisation and Maintenance and Periodicity », I

declare it accepted, subject to the agreed modifications.

**Mr. Martin** (in French). — In the third paragraph, it is mentioned « brake blocks », I think we should say: « brake shoes ».

**The President.** — Is that agreeable to all? (*Agreed.*)

— *The final text adopted is given hereafter:*

#### « Organisation of maintenance and periodicity.

« 8. Electric locomotives are expected to run large mileages of the order of 500 000 miles (800 000 km) over a period of 4 to 5 years before requiring complete overhaul. Certain Administrations report increased mileages with new locomotives.

« Daily inspections are of a very minor nature when they are carried out; depot inspections vary widely between Administrations (from 7 to 45 days according to the type of inspection and service operated).

« Three principal components which may govern periods between depot inspections are pantographs, brake blocks and tyres.

« A change of bogie, either in works or depot, or the use of reprofiling equipment without removal of the wheels from under the locomotive allows the rapid return of the locomotive to service when the tyres require reprofiling.

« A few Administrations replace heavy flange wear of tyres by deposition of weld metal without subsequent machining. »



**Mr. Cook :**

*Summary No. 9 (Chapter VII) :*

CHAPTER VII.

**Organisation of the service.**

Common user of electric locomotives, without segregation to individual drivers or small groups of drivers, is practically universal, particularly on the longest services.

Unless there are particular local reasons, there is no need for locomotives to return to depot until required for periodic maintenance. They can be immobilised in sidings and stations or actually on stabled trains ready to start work.

Electric locomotives are capable of practically continuous working and all Administrations aim at keeping them on continuous duty, changing crews whenever necessary. No adverse effect of this system can be detected.

Adequate cab heating is necessary when locomotives work or are temporarily stabled in low atmospheric temperatures.

**The President.** — Are there any comments on this summary ?

**Mr. Martin** (in French). — In the second paragraph it says :

« ... or actually at the head of stabled trains ready to start. »

I am not quite clear about what is meant by « actually » ? Possibly ?

**Mr. Cook.** — Have you a different word ?

**Mr. Nouvion** (in French). — It would be sufficient to suppress the word and then it would be all right.

**The President.** — It means nothing really, so there is no harm if we delete the word.

**Mr. Cook.** — No, we can delete it.

**Mr. Martin** (in French). — I am wondering if it is necessary to say :

« Adequate heating of the driving compartment is necessary... »

In fact, there are many other things that are also necessary : lighting, the steps to get into the compartment, etc.

**Mr. Cook.** — I, personally, Mr. President, think it is very necessary to put it in for the guidance of manufacturers. This paragraph is primarily on the utilisation organisation, but particularly the difference in the circumstances of operation for the electric locomotives compared with steam locomotives, and I think it is very important.

**M. Martin** (in French). — I do not see any objection to retaining this paragraph.

**The President.** — Any other point ?

**Mr. Alström.** — In the third paragraph, the last statement is « No adverse effect of this system can be detected ». I would ask is it really so ? Of course, I would prefer the economical advantages of the common-user system, but there are some adverse effects of the common-user system but the total advantages are many times higher than the adverse effects.

**Mr. Cook.** — I think, Mr. President, all Administrations think there is in fact no alternative, with the exception of the Spanish Railways on part of their system

but as the length of line electrified is extended, they will also employ it. There is no real comparison available.

**Mr. Martin.** — I suggest to suppress this sentence.

**The President.** — The last sentence only ?

**Mr. Cook.** — Do you mind that ?

**The President.** — Delete the last sentence.

**Mr. Cook.** — Take it out.

**The President.** — Do the Meeting agree ?

**Mr. Gerber** (in French). — We have had complete common user for thirty years or more, without having any trouble.

In my opinion, it is above all a question of staff discipline. I suggest we keep the text as it is.

**Mr. Maass.** — I think it depends very much on the education of the engineers and not everywhere it can have the same high level as in Switzerland. I suggest we leave it out.

**The President.** — Any other points on the whole of that summary ? (*Sign of assent.*) Subject to the approved alterations, I declare Summary No. 9 adopted.

— *The text adopted is worded as follows :*

### « Organisation of the service.

« 9. Common user of electric locomotives, without segregation to individual drivers or small groups of drivers, is practically universal, particularly on the longest services.

« Unless there are particular local reasons, there is no need for locomotives to return to depot until required for periodic maintenance. They can be immobilised in sidings and stations or on stabled trains ready to start work.

« Electric locomotives are capable of practically continuous working and all Administrations aim at keeping them on continuous duty, changing crews whenever necessary.

« Adequate cab heating is necessary when locomotives work or are temporarily stabled in low atmospheric temperatures. »

### Mr. Cook :

#### *Summary No. 10*

(*paragraphs 1 to 3 of Chapter VIII*) :

### CHAPTER VIII.

#### Cost of maintenance.

The ultimate basis upon which maintenance costs can be judged is cost per mile or kilometre.

The general aim is to obtain a very high mileage before workshop heavy repairs with extensive dismantling are necessary and at the same time to keep day to day maintenance costs low. The items which may contribute to this aim are :

- critical examination of costs of repairing components;
- critical examination of frequency of repairs to components;
- improvement of design to reduce wear and frequency of repairs;
- improvement of workshop methods to reduce costs of repairs;

- specialisation of the manufacture of spare parts and components;
- training of staff for specific maintenance operations.

Although the cost of each short or long period inspection is low, the sum total per annum of depot maintenance is high — generally greater than Main Works maintenance and this gives considerable scope for scrutiny with a view to effecting reduced costs.

**The President.** — Discussion on this summary is now open.

**Mr. Picard** (in French). — Amongst the factors likely to lead to reduced maintenance costs, I would like to mention arrangements making it easy to dismantle components or groups of components, to enable them to be repaired outside the locomotive.

**Mr. Cook.** — Yes, in other words there is a continuous desire to improve accessibility and ease of removal, ease of dismantling.

**The President.** — Yes, thank you.

**Mr. Picard** (in French). — Precisely. Moreover, in the sentence :

« ... the improvement of shop methods in order to reduce the cost of repairs », I think we should go into further details on a certain number of points.

First of all, the judicious selection of the maintenance periods, both as regards the nature and amount of the work as well as its spacing in time.

**Mr. Cook.** — Yes, I think we have debated that at considerable length on

previous summaries. I think the extension of period has already been fully covered.

**The President.** — Covered really by introduction to the paragraph.

**Mr. Cook.** — No, I think by particularly Summary No. 8.

**The President.** — It is also covered by Summary No. 8, « workshop » covered by that too.

**Mr. Cook.** — Yes.

**Mr. Picard.** — I think it would be simpler to say so. However, if you think it sufficient, I will not insist.

**The President.** — Any other points, subject to the addition to the sentence suggested by Mr. PICARD.

**Mr. Picard** (in French). — One thing more.

Though I am completely in agreement with the Reporter on the value of the sentence :

« Although the cost of inspections at short or long intervals is small, the total annual maintenance costs in the depot is high, generally higher than for maintenance in the shops », to draw attention to the cost of carrying out maintenance in the depot, I consider the expression « generally higher » is somewhat exaggerated.

As far as the S.N.C.F. is concerned, we have found that the cost of maintenance in the depot is in fact lower than that of maintenance in the shops.



**Mr. Cook.** — Mr. President, I agree that it may apply on the S.N.C.F. but I do not think it does everywhere and that is the object of putting this in. I think the S.N.C.F. have perhaps done it and that is why they want to put in forty-five to sixty days, but I do not believe other countries have reached that.

**Mr. Alström.** — Mr. President, I agree with my French colleague as we also have some tendency to do as much work as possible in the main works not in depots. We are striving in that direction because we have the best specialists and lowest costs in the main Works, and so I think the wording: « ... total per annum of depot maintenance is high—generally greater than Main Works maintenance », is not right. I would suggest instead of « generally » say « in many cases ».

**Mr. Picard** (in French). — I quite agree Mr. ALSTRÖM.

**The President.** — I think Mr. COOK agrees.

**Mr. Cook.** — In some cases or in many cases ?

**M. Martin** (in French). — The object of this paragraph is to insist on the importance of reducing maintenance costs in connection with the daily inspection in the depot. Consequently, by saying :

« ... maintenance in the depot is about the same as maintenance in the shops », I think the case would be met.

**Mr. Cook.** — Is it exactly the same Mr. President ?

**The President.** — No, it is not the equivalent.

**Mr. Martin** (in French). — Mr. President, we might also suppress the word « annual » and say : « ... the total cost... » instead of the « total annual cost... ».

**Mr. Squilbin** (in French). — Mr. MARTIN, does your suggestion also refer to « in most cases » and « equivalent... » or to one or the other ?

The sentence would then read :

« Although the cost of inspections at long or short intervals is small, the total cost of maintenance in the depot is high, *in most cases equivalent...* » or should it be :

« ... the total cost of maintenance in the depot is equal to that... »

**Mr. Martin** (in French). — Leave « in most cases ».

**Mr. Squilbin** (in French). — And leave out « equivalent » ?

**Mr. Martin** (in French). — « ... is, in most cases, of the same order as that of maintenance in the shops ».

**Mr. Squilbin** (in French). — In the opinion of the Special Reporter, we should not put both « in most cases » and « equivalent ». I think he does not quite agree with us on this point.

**Mr. Cook.** — « ... in some cases greater... »

**Mr. Martin** (in French). — Agreed.

**Mr. Squilbin** (in French). — I will read the text of the summary once more :

« Although the cost of the short or long period inspections is low, the total cost of depot maintenance is in certain cases higher than that of maintenance work in the shops.

« This fact... », etc.

I suggest it would be better to say :

« ... the total cost of maintenance in the depot is high, in certain cases higher than that of maintenance in the shops. »

**Mr. Picard** (in French). — I agree.

**Mr. Martin** (in French). — Mr. President, I would like to go back to some of the comments made by Mr. PICARD.

I am wondering whether it would not be better to alter alightly the numbers of the points contributing to low daily maintenance.

In effect, the steps to be taken can be divided under three main heading :

1) The essential point — as has moreover been pointed out — is the design of the machine in order to avoid if possible any damage occurring;

2) As a function of this design of the machines, the proper maintenance cycles must be selected as regards periodicity, importance and the content of these repair operations;

3) Then proper organisation is needed

to make sure that maintenance in the shops and in the depot costs as little as possible, i.e. be directed to the improvement of maintenance methods, the specialisation of the maintenance staff and maintenance establishments and finally the proper training of the staff.

I think that these are the three master ideas brought together by the Reporter.

It might be as well to take the trouble to group them in this way, whilst including obviously in these three points what the Reporters suggested in their general summary.

**The President.** — Is the proposal to reword the examples given ? There would be seven examples in the text, three main headings.

**Mr. Martin** (in French). — There would be three headings, which, I repeat, would be the following ones :

1) Improved design of the machines in order to avoid deterioration damage if you prefer. (We might put a colon and list a certain number of factors);

2) Careful selection of the maintenance periods (periodicity and work covered);

3) Improved methods, specialisation, training of staff.

**The President.** — May I add accessibility.

**Mr. Cook.** — I do not agree with that. I think if we now take the last two paragraphs of Chapter VIII of the summaries, I think that is a general qualifying period, perhaps lowest but

one put in Summary No. 10. We have said « The overall requirement, for which the electric locomotive has the possibility with suitable design and manufacture, is extensive user with minimum of idle periods, together with long periods between withdrawals for maintenance purposes ». I think that qualifies all the points which have been made.

**Mr. Martin** (in French). — I quite agree with the Special Reporter that I am not bringing any new ideas, so to say, and I do not insist upon an alteration in the wording, if you prefer to keep it as it is.

**The President.** — I think it may be easier in view of the time, which we have left. Are there any other points? It is perhaps also better that the paragraph to which Mr. Cook has referred should be included in the point which we are now discussing.

Well, in that case, are there any further comments on this summary? I declare it approved, subject to the addition made by Mr. PICARD at the beginning of the meeting, and the addition to Summary No. 10 of the following paragraph. We now come to the small single paragraph and I will ask Mr. Cook to read it out.

— *The text adopted for the Summary becoming No. 11 is worded as follows:*

« 11. The ultimate basis upon which maintenance costs can be judged is cost per mile or kilometre.

« The general aim is to obtain a very high mileage before workshop heavy

repairs with extensive dismantling are necessary and at the same time to keep day to day maintenance costs low. The items which may contribute to this aim are:

« — critical examination of costs of repairing components;

« — critical examination of frequency of repairs to components;

« — improvement of design to reduce wear and frequency of repairs;

« — improved design to facilitate accessibility and the removal of components in unit assemblies for repair off the locomotive;

« — improvement of workshop methods to reduce cost of repairs;

« — specialisation of the manufacture of spare parts and components;

« — training of staff for specific maintenance operations.

« Although the cost of each short or long period inspection is low, the sum total of depot maintenance is high — in some cases greater than Main Works maintenance and this gives considerable scope for scrutiny with a view to effecting reduced costs.

« The overall requirement, for which the electric locomotive has the possibility with suitable design and manufacture, is extensive user with minimum of idle periods, together with long periods between withdrawals for maintenance purposes. »

**Mr. Cook:**

*Summary No. 11  
(final paragraph of Chapter VIII)  
(becoming Summary No. 10):*

Only one Administration quotes a relation between maintenance costs and age of the



locomotive. Another point of view is that it is more closely related to the age of design.

**Mr. Maass.** — I would suggest this be the opening paragraph of the whole summary.

**Mr. Nouvion** (in French). — I think this might be deleted as well.

Only two Administrations are mentioned, who say approximately the same thing: when speaking of the age of the locomotive, it is also a question of the age of the design. What has been said previously is sufficient since the design must be improved.

**Mr. Cook.** — Your opinion Mr. President?

**The President.** — Any feelings on that?

**Mr. Maass.** — I do not agree we should omit it, if we refer to the wording of the Question 4 it is a definite question, the prime cost. If two Administrations replied to that I think we must state that and then come to our conclusion.

**Mr. Cook.** — It was the last few words of the questionnaire and I think it should be retained.

**Mr. Martin** (in French). — Mr. President, I think it would be unfortunate to end our summaries with this paragraph which does not add a great deal, whereas the previous one is very important.

Consequently, I request either that it should be changed round or suppressed, rather than end our summaries with a paragraph which, I repeat, is in fact of no importance.

**The President.** — Mr. MAASS said it should come at the beginning of this Chapter. The only reason it was put at the end is that it was the last sentence in the questionnaire and I think Mr. Cook agrees it would be better at the beginning of Chapter VIII.

Finally, one further word before we finish: the summary says that the cost depends much more on the age of the design. It is probably everyone's point of view and I wonder whether we should say: « The general point of view is that... ».

**Mr. Cook.** — If we put: « A more general point of view... ».

**The President.** — Would that be agreed? Any other points on that paragraph? (*Agreed.*) I declare it adopted as Summary No. 10, which will be put at the beginning of Chapter VIII.

— *The altered text, which was adopted, is the following:*

#### « Cost of maintenance.

« 10. Only one Administration quotes a relation between maintenance and age of the locomotives. A more general point of view is that it is more closely related to the age of design. »

**The President.** — Now Ladies and Gentlemen, there remains only for me to close the works of Section II for 1958 and in doing so I want to express the thanks of all of us here to a number of people. First of all, I want to thank on your behalf Mr. COOK and Dr. GAEBLER for all the work they have done, and also I want to thank on your behalf Mr. VIANI and Mr. CANAVEZES for the work they have done for there is a great deal of work to be done for each paper. I then want to thank my friend Mr. SQUILBIN for a great deal of help and the other Gentlemen who have worked over here in the afternoons and each night even, achieving a successful draft minute in accordance with your wishes and I want to thank you all too. What a pleasure it has been to work with Mr. IVANOV here, who has not

said very much, but who has assisted us and is sitting beside me.

Lastly, I want to thank you all for being very kind to your President. Gentlemen, that is all and I declare this meeting closed.

**Mr. Martin** (in French). — Mr. President, on behalf of all the Delegates, I wish to express to you our warmest and most sincere thanks.

I must add my apologies for causing you a certain amount of trouble as well as to the other members of the Secretariat Staff. (*Applause.*)

**The President.** — Thank you Mr. MARTIN for your kind words and now I really do declare the meeting closed.

— The session ended at 11.40 a.m.

---

## DISCUSSION AT THE PLENARY MEETING.

### Meeting of the 7th October 1958.

PRESIDENT : Sr. D. AGUSTÍN PLANA.

GENERAL SECRETARIES : MESSRS. P. GHILAIN AND J. PÉREZ POZUELO.

**Mr. Ghilain, General Secretary** (in French). — We now come to Question 4, the summaries for which adopted by the Section were published in Nos. 4 and 6 of the *Daily Journal of the Congress*.

Mr. GHILAIN then read each summary in turn.

— *The reading of the text of the summaries did not give rise to any comments.*

**The President** (in French). — We will therefore consider the summaries for Question 4 as ratified.

#### SUMMARIES.

##### Wear of rails and tyres.

« 1. The life of rails under electric traction, according to some Administrations, is less than with steam traction. This is not only due to electrification itself, but in particular to the more intensive services which normally accompany electrification.

« Flange wear on tyres and side cutting of rails has been greatly reduced by the provision of lubricators placed at suitable positions at curves or on the locomotives. The reduction of

« flange wear is of great economic importance as approximately three times the flange wear has to be removed from the thread of the tyre to reform the flange.

« 2. The amounts of wear permitted for tyres vary somewhat between the Administrations and are based mainly on experience. Practical and theoretical studies to determine better limiting profiles are being pursued.

« Some Administrations have so far used only nose suspended motors; others have also used fully suspended motors. It has not been possible to establish any definite relationship between motor suspension systems and wear on tyre or rail. Whereas fully suspended motors have been adopted principally for the advantages gained in the working conditions of the motors themselves, it is also anticipated that the reduction in unsprung weight will result in an improvement in the life of tyres and rails.

« Practically all new electric locomotives are being constructed in the double bogie designs which limit wheel diameter to a maximum of about 4 feet (1.250 m). This does no doubt increase tyre wear and rail end hammering, although there are no quanti-



« tative effects to report but it is considered that these drawbacks are largely compensated by the advantage of total adhesion of the locomotive.

« Tyre wear does not vary in any relationship to its machined diameter within the overall variation permitted between maximum and minimum thickness.

« 3. No general agreement is indicated to limitations of axle-loading to wheel diameter. There are indications that thought is being given to this and some Administrations have in mind a figure of 4.5 to 5 tons (axle load) per foot of diameter (14.5 to 16.5 tons per metre). Such figures may however place onerous restrictions on locomotive design.

« There is no direct evidence that the increased average speed of electric traction, by itself, contributes to rail or tyre wear.

« There is no clear indication of the effect which the type of bogie (articulated or non-articulated) has on flange wear. Some Administrations report reduced flange wear with bogies having a centralising link between them. Any increase in recoil force beyond a certain limit, however, increases the amount of flange wear.

« Severe rail corrugation is only reported by one Administration.

#### Maintenance of traction motors.

« 4. Design of traction motors should enable as high a mileage as possible to be obtained before commutators are re-turned. Mileages of 500 000

« (800 000 km) should be obtained so that re-turning may not be necessary before the general repair stage of the locomotive is reached. There is a constant aim to make this mileage rise.

« The use of modern insulating materials allows, on one hand, the design of new motors with a higher power in relation to volume and on the other hand, an increase in the life of existing types of motors.

« There is division of opinion as to whether it is necessary to fit keys in armature shafts and pinions; the fitting of keys predominates on older types of motors but there is a tendency to eliminate keys in new types.

« It is universal practice to fit pinion on to shaft by shrinking on a taper.

« Opinion is also divided concerning the desirability of keeping pinions and spur wheels mated.

« 5. Flashovers on electric locomotives are rare. They are generally caused by frost and snow, contamination by smoke, dust and exhaust from steam locomotives or by lightning.

« The preventative measures which are detailed in the reports, concern briefly :

« current collection,  
« design of motors,  
« design of protective equipment,  
« design of control gear and driving technique.

#### Lubricants.

« 6. Grease lubrication is used generally in traction motor armature roller bearings.

« Both grease and oil are used in axle  
« or hollow shaft bearings.

« Different characteristics are speci-  
« fied in lubricants to meet seasonal  
« changes of temperature but generally  
« this becomes a gradual change towards  
« the desired properties by addition  
« rather than complete changes.

« Heavy grease or gear compound is  
« used universally in traction motor  
« gear.

« No reports of the use of new lubri-  
« cants (bisulphide of molybdenum or  
« lithium) have been received.

#### **Wear on the pantograph strips.**

« 7. Pantograph strips most generally  
« used are flat strips of copper, alumi-  
« nium copper, cadmium copper or cop-  
« per bearing steel but there is a ten-  
« dency to a more general use of carbon.

« Recent experience and trials have  
« shown a tendency towards more gene-  
« ral use of carbon and metallized car-  
« bon.

« Graphite grease is the most usual  
« lubricant. It can be applied quickly  
« and easily and is effective.

« When pantograph strips are worn, it  
« is usual to change pans.

« For a given material, strip life varies  
« considerably, being influenced by cli-  
« matic and atmospheric conditions,  
« speed, type of service and pantograph  
« pressure.

« Upward static pressure of panto-  
« graph is generally specified to be  
« between 16 and 20 lb. (7 and 9 kg).

#### **Organisation of maintenance and periodicity.**

« 8. Electric locomotives are expected  
« to run large mileages of the order of  
« 500 000 miles (800 000 km) over a  
« period of 4 to 5 years before requiring  
« complete overhaul. Certain Admi-  
« nistrations report increased mileages  
« with new locomotives.

« Daily inspections are of a very  
« minor nature when they are carried  
« out; depot inspections vary widely be-  
« tween Administrations (from 7 to  
« 45 days according to the type of  
« inspection and service operated).

« Three principal components which  
« may govern periods between depot  
« inspections are pantographs, brake  
« blocks and tyres.

« A change of bogie, either in works  
« or depot, or the use of re-profiling  
« equipment without removal of the  
« wheels from under the locomotive al-  
« lows the rapid return of the locomotive  
« to service when the tyres require  
« reprofiling.

« A few Administrations replace  
« heavy flange wear of tyres by deposi-  
« tion of weld metal without subsequent  
« machining.

#### **Organisation of the service.**

« 9. Common user of electric loco-  
« motives, without segregation to indi-  
« vidual drivers or small groups of  
« drivers, is practically universal, parti-  
« cularly on the longest services.

« Unless there are particular local  
« reasons, there is no need for loco-  
« motives to return to depot until re-

« quired for periodic maintenance. They  
« can be immobilised in sidings and sta-  
« tions or on stabled trains ready to  
« start work.

« Electric locomotives are capable of  
« practically continuous working and  
« all Administrations aim at keeping  
« them on continuous duty, changing  
« crews whenever necessary.

« Adequate cab heating is necessary  
« when locomotives work or are tem-  
« porarily stabled in low atmospheric  
« temperatures.

### Cost of maintenance.

« 10. Only one Administration quotes  
« a relation between maintenance and  
« age of the locomotives. A more  
« general point of view is that it is more  
« closely related to the age of design.

« 11. The ultimate basis upon which  
« maintenance costs can be judged is  
« cost per mile or kilometre.

« The general aim is to obtain a very  
« high mileage before workshop heavy  
« repairs with extensive dismantling are  
« necessary and at the same time to keep  
« day to day maintenance costs low.  
« The items which may contribute to  
« this aim are :

« — critical examination of costs of  
« repairing components;

« — critical examination of frequency  
« of repairs to components;

« — improvement of design to reduce  
« wear and frequency of repairs;

« — improved design to facilitate  
« accessibility and the removal of com-  
« ponents in unit assemblies for repair  
« off the locomotive;

« — improvement of workshop me-  
« thods to reduce cost of repairs;

« — specialisation of the manufac-  
« ture of spare parts and components;

« — training of staff for specific  
« maintenance operations.

« Although the cost of each short or  
« long period inspection is low, the sum  
« total of depot maintenance is high —  
« in some cases greater than Main  
« Works maintenance and this gives  
« considerable scope for scrutiny with  
« a view to effecting reduced costs.

« The overall requirement, for which  
« the electric locomotive has the possi-  
« bility with suitable design and manu-  
« facture, is extensive user with mini-  
« mum of idle periods, together with  
« long periods between withdrawals for  
« maintenance purposes. »



# OFFICIAL INFORMATION

ISSUED BY THE

## PERMANENT COMMISSION

OF THE

### International Railway Congress Association.

---

Meeting of the Permanent Commission, held on the 7th March 1959.

---

The Permanent Commission of the International Railway Congress Association held a meeting on the 7th March 1959, at 3 p.m., in the Belgian National Railways Headquarters Offices, at Brussels.

\* \* \*

Mr. DE VOS, *President*, opening the meeting addressed a warm welcome to the personalities present. Then, he requested the Assembly to approve the Minutes of the last meetings held in Madrid, respectively on the 29th September and 7th October 1958.

\* \* \*

The PRESIDENT announced with deep regret the death, on the 6th February last, of Mr. G.H. DIJKMANS VAN GUNST, who was General Director to the Ministry of Transport and Waterstaat of the Netherlands. His successor on the Permanent Commission will be designated in the near future.

On the other hand, Mr. F.Q. DEN HOLLANDER, retired from his position of President of the Netherlands Railways, is replaced by his successor, Mr. J. LOHMANN.

The mandate on the Permanent Commission belonging to the Italian Government, vacant since the Madrid Congress, is conferred to Mr. ROSCIONI, Inspecteur Général Supérieur de la Motorisation Civile et des Transports Concédés, au Ministère des Transports.

Sir Gilmour JENKINS, Vice-President of the Executive Committee, Permanent Secretary to the Ministry of Transport and Civil Aviation of Great Britain, ceasing his functions on the 31st March, will be replaced.

On the other hand, the mandate of Mr. NOLET DE BRAUWERE, General Secretary of the Belgian National Railways (S.N.C.B.), now retired, is extended up to the next Congress, after fulfilment of the procedure prescribed by article 6 of the Rules and Regulations.

— These proposals were unanimously ratified by the Assembly.

*(The complete list of the Members of the Permanent Commission is given in Appendix I.)*

\* \* \*

The PRESIDENT stated that the Indian Government, when confirming the invitation made in Madrid, has proposed to hold in New Dehli, an Enlarged Meeting of the Permanent Commission, during the month of December next.

Mr. L.T. MADNANI, *Railway Adviser to the High Commissioner for India*, in London, expressed his satisfaction for the agreement of the Permanent Commission relative to the Session in India and gave particulars about the arrangements considered. The date fixed would be as mentioned during December next; the meeting is expected to last three days for the technical work. In addition, certain technical visits will take place.

The PRESIDENT stated that, in 1960, the 75th Anniversary of the foundation of the Association will be celebrated. The Enlarged Meeting of the Permanent Commission will be held in Brussels during the month of June, and a technical programme has been drafted.

The PRESIDENT announced the preparatory measures already considered as well as the setting up of a special Commission created for the organisation of the above mentioned Session.

— *The technical programme of the Meetings of New Delhi (1959) and Brussels (1960) is given in Appendix II.*

Mr. GHILAIN, *General Secretary*, reported on the progress of the preparatory work in view of the meetings of New Delhi and Brussels and gave knowledge of the proposals for the designation of the Special Reporters and of the Presidents of Section.

Up to the present, three of the four questionnaires relative to the four questions to be discussed at New Delhi and Brussels have been drafted and sent out to the affiliated Administrations; the fourth questionnaire will be forwarded in the very near future.

— The Assembly approved the above proposals.

\* \* \*

The GENERAL SECRETARY gave to the Assembly the results of the written ballot prescribed by article 4 of the Rules and Regulations in view of the eventual affiliation of the *Israel State Railways*. The results exceed greatly the percentage prescribed in the above-mentioned article 4, and it was proposed to complete the List of countries belonging to the Association appended to the Rules and Regulations by the addition of the Israel State.

— Adopted.

— *The text of the Rules and Regulations of the Association, together with the List of affiliated countries is reproduced in Appendix III.*

\* \* \*

The receipts and expenditure accounts for the financial year 1958 as well as the draft of budget for 1959 were also approved.

Mr. GHILAIN gave full particulars about the favourable financial position of the Association and mentioned that it is proposed, as for the financial year 1958, to maintain the reduced rate of the contribution to 0,14 gold franc per kilometre for the year 1959.

— This proposal was adopted.

\* \* \*

The PRESIDENT reported that, during the last Madrid meeting of the Permanent Commission, it was stated that the discussions which took place in the *Vth Section* showed the opportunity to alter the denomination of the Section.

As the present tendency of the railway undertakings is to use more and more lorries and buses in their operating services, it seems indicated to earmark *Section V* in the future for all questions relative to the utilisation of this kind of stock. Therefore, it is proposed to name this Section as follows: *OPERATING OF SUBSTITUTE AND ADDITIONAL SERVICES*.

Mr. UPMARK, *Swedish State Railways*, who raised this question at the Madrid Congress, was consulted about this new title and he gave his agreement.

A definition of this title will be studied by a special sub-commission of the Executive Committee and will be submitted to the Permanent Commission during the next meeting.

— Adopted.

\* \* \*

Mr. GHILAIN, stated that during 1958, only the resignation of the *Delaware & Hudson Railroad Corporation* (1 203 km) (U.S.A.) was recorded.

It was proposed, on the other hand, to suppress the name of the *Long Island Railroad* from our lists, as this railroad has not paid its contribution (634 km) since 1950.

Furthermore, a request for membership has been received from the « *Chemins de Fer de l'Est de Lyon* », company which operates only 75 km of standard gauge lines, but the total amount of its receipts exceeded 3 000 000 gold francs in 1958.

As this system is of some importance and constitutes in some way a subsidiary of the *French National Railways* (S.N.C.F.) endeavouring to work with up to date technical railway methods, it is proposed to depart exceptionally from the clause of the Rules and Regulations, prescribing a minimum of 100 km of lines operated, and to accept the affiliation of this undertaking.

— This proposal was approved.

\* \* \*

The International Railway Congress Association includes therefore, at present, 34 Governments, 11 Organisations and 102 Administrations, with a total mileage of 379 100 (601 097 km).

\* \* \*

The meeting ended after the examination of various items concerning the activities of the Association, in particular in connection with the « *Bulletin Sales* » and « *Advertising* » departments.

P. GHILAIN,  
*General Secretary,*

M. DE VOS,  
*President.*

---

---



# List of Members of the Permanent Commission

## OF THE

### INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

(MARCH 7, 1959.)

*President :*

**M. De Vos** (1), Directeur Général de la Société Nationale des Chemins de fer belges; 19, rue du Beau-Site, Bruxelles.

*Vice-Presidents :*

**J. Goursat** (2), Directeur de la Région du Nord de la Société Nationale des Chemins de fer français; 18, rue de Dunkerque, Paris (X<sup>e</sup>);

**M. Crem** (2), Directeur du Service de l'Exploitation de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles.

*Members of the Executive Committee :*

**E. Dorges** (1), Secrétaire Général Honoraire aux Travaux Publics et aux Transports, Délégué Général aux Affaires Internationales du Ministère des Travaux Publics, des Transports et du Tourisme; 244, boulevard Saint-Germain, Paris;

**Sir John Benstead** (2), Deputy Chairman of the British Transport Commission; 222, Marylebone Road, London, N.W.1;

**Sir Gilmour Jenkins** (1), Permanent Secretary, Ministry of Transport and Civil Aviation (Great Britain); Berkeley Square House, Berkeley Square, London, W.1.

*Ex-presidents of session, members ex-officio :*

**D<sup>r</sup> Ing. G. di Raimondo**, Directeur Général des Chemins de fer italiens de l'Etat (*retired*); Rome;

**Ibrahim Fahmy Kerim**; Le Caire;

**D<sup>r</sup> W. Meile**, ancien Président de la Direction générale des Chemins de fer fédéraux suisses; Brugglerweg, 11, Berne;

**A. Plana**, Sous-Secrétaire d'Etat aux Travaux Publics et Président du Conseil d'Administration du Réseau National des Chemins de fer espagnols; Madrid.

**General Sir Brian Robertson**, Bart., G.C.B., G.B.E., K.C.M.G., K.C.V.O., D.S.O., M.C., Chairman, British Transport Commission, 222, Marylebone Road, London, N.W.1.

*Members :*

**E.T. Aalto** (1), Directeur Général des Chemins de fer de l'Etat de Finlande; Helsinki;

**Mohamed Affi** (1), Directeur Général Adjoint des Chemins de fer de la République d'Egypte; Le Caire.

**Abdel Moneim Azmy** (1), Sous-Secrétaire d'Etat au Ministère des Communications d'Egypte; Le Caire;

**Sir John Benstead** (already named);

**R. Besnard** (3), Chef de Service adjoint au Directeur général des Chemins de fer et des Transports, Ministère des Travaux publics, des Transports et du Tourisme; 244, boulevard Saint-Germain, Paris;

**David Blee** (1), General Manager, London Midland Region, British Railways; Euston Station, London, N.W.1;

**Dr. H. Born** (2), Directeur de l'Union d'Entreprises Suisses de Transports; Bundesgasse 28, Berne;

**Dr. L. Branca** (1), Vice-Directeur Général des Chemins de fer italiens de l'Etat; Rome.

**A. Brouckaert** (3), Directeur du Service du Matériel et des Achats de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;

(1) Retires at the 18th session.

(2) Retires at the 19th session.

(3) Retires at the 20th session.

- E. **Clarembaux** (1), Directeur du Service de la Voie de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;
- D<sup>r</sup> R. **Cottier** (2), Directeur de l'Office Central des Transports Internationaux par Chemins de fer; Berne;
- T.C. **Courtney** (1), Member of the Coras Iompair Eireann; Kingsbridge Station, Dublin;
- M. **Crem** (already named);
- G. **Csanadi** (2), Premier Adjoint du Ministre des Communications et des Postes (Hongrie); Budapest;
- D<sup>r</sup> Ing. A. **Cuttica** (1), Directeur Général Adjoint et Conseiller d'Administration des Chemins de fer italiens de l'Etat; Rome;
- Ph. **Dargeou** (1), Directeur Général de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IX<sup>e</sup>);
- J. **de Aguinaga** (3), Directeur Adjoint du Réseau National des Chemins de fer espagnols; Madrid;
- E. **Derijkere** (3), Directeur du Service de l'Electricité et de la Signalisation de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;
- M. **De Vos** (already named);
- M. **Dias Trigo** (2), Directeur des Services d'Exploitation et du Matériel de la Direction des Transports terrestres au Ministère des Communications du Portugal; Lisbonne;
- D<sup>r</sup> Ing. G. **di Raimondo** (already named);
- E. **Dorges** (already named);
- A.R. **Dunbar** (2), Manpower Adviser, British Transport Commission; 222, Marylebone Road, London N.W.1;
- Sir John **Elliot** (2), Chairman of the London Transport Executive; 55, Broadway, Westminster, London, S.W.1;
- Mohamed Halim **El-Rashid** (1), Directeur Général des Chemins de fer de la République d'Egypte; Le Caire;
- J.M. **Garcia-Lomas** (3), Vice-Président du Conseil d'Administration du Réseau National des Chemins de fer espagnols; Madrid;
- H. **Geitmann** (1), Präsident der Deutschen Bundesbahn; Friedrich-Ebert-Anlage, 43-45, Frankfurt (Main);
- Dr. Ing. P. **Giobbe** (1), Directeur du Service du Personnel et des Affaires Générales des Chemins de fer italiens de l'Etat; Rome;
- J. **Goursat** (already named);
- K.W.C. **Grand** (3), General Manager, Western Region, British Railways; Paddington Station; London, W.2;
- D<sup>r</sup> H. **Gschwind** (3), Président de la Direction Générale des Chemins de fer fédéraux suisses; Berne;
- R. **Guibert** (3), Directeur Général Adjoint de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IX<sup>e</sup>);
- F. **Hebert** (3), Directeur Général Adjoint de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IX<sup>e</sup>);
- R. **Hoens** (2), Directeur Général de la Société Nationale belge des Chemins de fer vicinaux; 14, rue de la Science, Bruxelles;
- I.A. **Ivanov** (2), Candidat des Sciences Techniques, Directeur de l'Institut Scientifique des Chemins de fer de l'U.R.S.S.; Moscou;
- M. **Jacobshagen** (3), Ministerialdirektor, Leiter der Betriebsabteilung in der Hauptverwaltung der Deutschen Bundesbahn; Friedrich-Ebert-Anlage, 43-45, Frankfurt (Main);
- Sir Gilmour **Jenkins** (already named);
- Ibrahim Fahmy **Kerim** (already named);
- Dr. Ing. Moustapha **Khalil** (2), Ministre des Communications d'Egypte; Le Caire;
- A. **Kriz** (1), Ingénieur, Conseiller Supérieur de Section au Ministère des Communications de la République tchécoslovaque; Prague;
- R. **Kunz** (3), Directeur de l'Office fédéral des transports; Berne;
- D<sup>r</sup> N. **Laloni** (2), ancien Directeur Général Adjoint des Chemins de fer italiens de l'Etat; Rome;
- Brig. Ch.A. **Langley** (3), Chief Inspecting Officer of Railways, Ministry of Transport and Civil Aviation; Berkeley Square House, Berkeley Square, London, W.1;
- J. **Lohmann** (2), Président des Chemins de fer Néerlandais, S.A.; Utrecht;
- D.P. **Loomis** (1), President, Association of American Railroads; Transportation Building, Washington, 6. D.C.;

(1) Retires at the 18th session.

(2) Retires at the 19th session.

(3) Retires at the 20th session.

- P. Lorenzo Ochando** (3), Director General de Ferrocarriles, Tranvías y Transportes por Carretera; Madrid;
- W.H. Maass** (1), Advisory Engineer to the High Commissioner for the Union of South Africa; South Africa House, Trafalgar Square, London, W.C.2.;
- L.T. Madnani** (3), Railway Adviser to the High Commissioner for India in London; Government Building, Bromyard Avenue, Acton, London, W.3.;
- M. Malderez** (3), Secrétaire Général du Ministère des Communications de Belgique; 17 a, rue de la Loi, Bruxelles;
- R.F. Marriott** (2), Advisory Engineer, Representative of the New Zealand Government Railways, New Zealand House; 415, Strand, London, W.C.2.;
- Dr W. Meile** (already named);
- Ing. Z. Modlinski** (3), Sous-Secrétaire d'Etat au Ministère des Communications de Pologne; Varsovie;
- P.C. Mukerjee** (1), Chairman, Railway Board, Ministry of Railways, Government of India; New Delhi;
- J.P. Musquar** (2), Directeur Général de la Société Nationale des Chemins de fer Luxembourgeois; 17, rue du Nord, Luxembourg;
- P. Nolet de Brauwere** (1), Secrétaire Général Honoraire de la Société Nationale des Chemins de fer belges; 121, avenue F. Lambeau, Bruxelles;
- Prof. Dr. jur. H.M. Oeffering** (2), Vorsitzender des Vorstandes und Erster Präsident der Deutschen Bundesbahn; Friedrich-Ebert-Anlage, 43-45, Frankfurt (Main);
- G. Olivier** (2), Administrateur de l'Office National pour l'achèvement de la Jonction Nord-Midi; 26, avenue Milcamps, Bruxelles;
- A. Plana** (already named);
- J. Puig Batet** (3), Directeur du Réseau National des Chemins de fer espagnols; Madrid;
- J. Ratter** (1), Technical Adviser, British Transport Commission; 222, Marylebone Road, London, N.W.1.;
- P. Renaud** (1), Vice-Président du Conseil d'administration de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IX<sup>e</sup>);
- Dr. Ing. S. Rissone** (2), Directeur Général des Chemins de fer italiens de l'Etat; Rome;
- General Sir Brian Robertson** (already named);
- Dr.-Ing. E. Roscioni** (2), Inspecteur Général Supérieur de la Motorisation Civile et des Transports concédés au Ministère des Transports (Italie), Rome;
- H. Saito** (3), Directeur du Département Etranger aux Chemins de fer Nationaux du Japon; Chiyodaku Tokio;
- Dr M. Schantl** (1), Directeur Général des Chemins de fer fédéraux autrichiens; 9, Elisabethstrasse, Vienne I.;
- Dr. F. Schelp** (1), Mitglied des Vorstandes und Präsident der Deutschen Bundesbahn; Friedrich-Ebert-Anlage, 43-45, Frankfurt (Main);
- H.E. Simpson** (2), President, Baltimore and Ohio Railroad Company; Baltimore, Md.;
- P.E.N. Skov** (1), Directeur Général des Chemins de fer de l'Etat danois; 40, Sölvgade, Copenhague, K.;
- R. Soulard** (1), Directeur du Mouvement de la Société Nationale des Chemins de fer français; 8, rue de Londres; Paris (IX<sup>e</sup>);
- H.E. Stokke** (3), Directeur Général des Chemins de fer de l'Etat norvégien; Oslo;
- Ing. J. Švagel** (3), Directeur de l'Institut Ferroviaire de la Direction Générale des Chemins de fer Yougoslaves; Belgrade;
- J. Tuja** (2), Secrétaire Général de l'Union internationale des Chemins de fer; 10, rue de Prony, Paris;
- E.G.J. Upmark** (3), Directeur Général des Chemins de fer de l'Etat suédois; Stockholm;
- R. Vaubourdolle** (3), Chef Adjoint des Installations Fixes de la Société Nationale des Chemins de fer français; 42 rue de Châteaudun, Paris;
- F. Perez Villamil** (3), Directeur Adjoint du Réseau National des Chemins de fer espagnols; Madrid;
- W. White** (1), President, Delaware & Hudson Railroad Corporation; 230, Park Avenue, New York 17.;
- Dr. Ing. W. Wyrzykowski** (2), Vice-Directeur de l'Institut Scientifique des Essais et des Recherches Ferroviaires des Chemins de fer de l'Etat Polonais; Varsovie;
- |                       |                         |
|-----------------------|-------------------------|
| N..... (3) Argentina. | N..... (2) U.S.A.       |
| N..... (1) Argentina. | N..... (1) Italy.       |
| N..... (3) Bulgaria.  | N..... (1) Netherlands. |
| N..... (3) China.     | N..... (3) Roumania.    |
| N..... (3) Spain      | N..... (3) Switzerland  |

(1) Retires at the 18th session.

(2) Retires at the 19th session.

(3) Retires at the 20th session.



*Honorary President* : F.H. Delory, Directeur Général honoraire de la Société Nationale des Chemins de fer belges; 2, avenue Curé Glibert, Rixensart.

*Members of Honour* : L. Armand, ancien Président du Conseil d'administration de la Société Nationale des Chemins de fer français;

O.V.S. Bulleid, former Chief Mechanical Engineer, Coras Iompair Eireann, and former Chief Mechanical Engineer, Southern Region, British Railways; St. Anthony's Close, Belstone, Devon.

R. da Costa Couteiro, ancien Président du Conseil supérieur des Travaux publics au Ministère des Travaux publics et des Communications du Portugal; Alameda das Linhas de Torres, 149, Lisbonne.

P. Ghilain, Directeur honoraire du Service du Matériel et des Achats de la Société Nationale des Chemins de fer belges, Secrétaire Général de l'Association; 19, rue du Beau-Site, Bruxelles.

Ranald J. Harvey, Consulting Engineer; 34, Victoria Street, Westminster, London, S.W.1.

The Rt. Hon. Lord Hurcomb, G.C.B., K.B.E., Chairman, British Transport Commission 1947-53; 47, Campden Hill Court, Campden Hill Road, Kensington, London W. 8.

U. Lamalle, Directeur Général honoraire de la Société Nationale des Chemins de fer belges, professeur émérite de l'Université de Louvain; 27 rue de l'Aurore, Bruxelles.

---

SECRETARY'S OFFICE : 19, rue du Beau-Site, Brussels.

General Secretary : P. Ghilain.

---

ENLARGED MEETINGS OF THE PERMANENT COMMISSION

(New Delhi, 1959 and Brussels 1960).

---

LIST OF QUESTIONS  
for discussion  
WITH THE NAMES OF THE REPORTERS.

---

SECTION I : WAY AND WORKS.

---

QUESTION 1.

(Brussels, 1960.)

The effect of electric traction on signalling and communication circuits, in particular reference to the means of overcoming interference, to provide safety and good communications.

*Reporters :*

*English speaking countries :*

Mr. Sven SVENSSON, Kungl. Järnvägsstyrelsen, Elektrotekniska byran; Stockholm, and

Mr. J.A. BROUGHALL, Electrical Engineer (Development), British Transport Commission, British Railways Division; Office of the Chief Electrical Engineer, 14, Melbury Terrace, Marylebone, London, N.W. 1.

*Other countries :*

M. R. RIGHI, Directeur Central au Service des Installations Electriques, Chemins de fer italiens de l'Etat; Piazza della Croce Rossa, 1, Rome.

---

## SECTION II : LOCOMOTIVES AND ROLLING STOCK.

---

### QUESTION 2.

(New Delhi, 1959.)

**Problems met in the design of multi-current rolling stock.**

**Existing types : experimental results.**

**Future developments.**

*Reporters :*

*English speaking countries :*

M. J.J. JONKER, Chef du Service du Matériel et des Installations Electriques, N.V. Nederlandsche Spoorwegen; Moreelsepark, Utrecht.

*Other countries :*

M. l'Ing. K. VON MEYENBURG, Premier Chef de Section de la Division de la Traction et des Ateliers, Chemins de fer fédéraux suisses; 6, rue de l'Université, Berne.

---

## SECTION III : WORKING.

---

### QUESTION 3.

(Brussels, 1960.)

**Transport on railway wagons of road-lorries and trailers loaded with goods.**

**Questions arising from this mode of transport :**

- The role of the road-hauliers;
- Tariffs to be applied;
- Characteristics of the railway rolling stock to be employed;
- Installations for loading and unloading;
- Use of single wagons, or of sets of wagons, or of complete trains for this kind of transport.

**Results already obtained and possibilities of extending this mode of transport.**

*Reporters :*

*English speaking countries :*

Bundesbahnberrat Dr. SCHRADER, Hauptverwaltung der Deutschen Bundesbahn; Friedrich-Ebert-Anlage, 43-45, Frankfurt-am-Main.



*Other countries :*

M. LOHIER, Ingénieur en Chef, Chef Adjoint de la Direction Commerciale, Société Nationale des Chemins de fer français; 54, boulevard Haussmann, Paris (IX<sup>e</sup>).

---

## SECTION IV : GENERAL.

## QUESTION 4.

*(Brussels, 1960.)*

What steps can be taken to develop and maintain co-operation between management and staff to improve productivity.

What scope is there for work study and incentive schemes ?

*Reporters :**English speaking countries :*

Mr. E.J. LARKIN, Director of Work Study, British Transport Commission; 222, Marylebone Road, London, N.W. 1.

*Other countries :*

M. E.M. ARIJS, Inspecteur Principal Adjoint à la Direction du Personnel et des Services Sociaux, Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles 1.

---

---

## Rules and Regulations of the International Railway Congress Association.

MARCH 1959.

### Objects, headquarters and constitution of the Association.

ARTICLE 1. — The object of the International Railway Congress Association is to facilitate the progress and development of railways by the holding of periodical Congresses and by means of publications.

The headquarters of the Association are at Brussels.

ART. 2. — The Association is composed of State Railway Administrations, and of Administrations directly concerned with the working of railways of public utility in countries which have joined the Association.

It is composed of the Railway Administrations included in the list which has been published in the Bulletin of the Railway Congress of September 1922, p. 1274.

The Governments of the countries to which the Association extends may also join the Association.

The list of these countries (see appendix) may be altered by a decision of the Permanent Commission, as stated in article 4.

International Organisations which deal essentially with railway operation may be admitted as adherents of the Association, as may also National Unions of railways not belonging to the Association operating either a minimum mileage of 5 000 kilometres (3 107 miles), or a mileage at least equal to 10 per cent of the total railway network of the country.

### Permanent Commission.

ART. 3. — The Association acts through a Permanent Commission composed of members nominated according to article 6.

ART. 4. — The Permanent Commission can, by a postal vote, giving a majority of three quarters of the total membership, alter the list of countries belonging to the Association.

It has power to arrange for the admission of Organisations in a position to belong to the Association and of Railway Administrations, subject to a written report prepared by a member nominated in each case by the President.

The only Railway Administrations who may be admitted to the Association, beyond those who constituted it in 1922, are those whose principal business is the running of railways worked by mechanical traction, whether owned or leased by a public authority, open for public traffic and having a length of at least 100 kilometres (62 miles) open for traffic and average receipts per annum, over the last three years of at least two million gold francs <sup>(1)</sup>.

Administrations cease to belong to the Association if they fall within either of the following categories :

a) Undertakings which enter into liquidation or default and Railway Administrations which cease to operate their lines directly in the public service;

b) Members who have not paid their subscriptions for more than two years and who, having been duly notified, have not paid the arrears;

c) Railway Administrations admitted subsequently to the formation of the Association in 1922, which no longer fulfil the conditions laid down in the 3rd paragraph of this article.

The admission of an Administration in a State which itself is only provisionally included in the Association, under the terms of the 1st paragraph of this article, remains provisional until the admission of the State itself is confirmed.

---

<sup>(1)</sup> In calculating the length of line, sections of mountain railway worked by special methods of haulage are taken as equivalent to twice their length.

ART. 5. — The Commission shall organise the Congress meetings, prepare an agenda for discussion, be responsible for their preliminary treatment, edit and publish reports for the discussions, draw up a balance sheet, fix, subject to article 17, the amount of the annual subscriptions, be responsible for the finances, and set on foot any investigations and issue any reports or other publications which will, in its judgment, further the objects of the Association.

ART. 6. — The Permanent Commission shall be composed of ex-Presidents of the sessions of the Congress, ex-officio members, of elected members, the number of which shall be fixed by each Congress, and of Members of Honour and Honorary Presidents.

The elected members shall be, as far as possible, chosen to represent the different Nations. Under no circumstances, shall any one Nation have more than nine elected members.

The Members of Honour are chosen amongst the elected members of the Permanent Commission, when they have been serving permanently on the Permanent Commission for at least 20 years.

In exceptional cases, the Congress will have the right to confer the title of Member of Honour to former members who, though not fulfilling the above conditions, will have rendered exceptional services to the Association.

One third of the elected members shall retire at each Congress and shall be eligible for re-election.

Members who have ceased to hold office of any kind, so that they are no longer attached to the railway service of an adherent Government, to an adherent Organisation or to a participating Administration, which qualified them at the time of their election, shall cease to be members of the Permanent Commission. It shall be the duty of such a member at once to inform the President when he retires. The Permanent Commission may, upon the application of five members, with the consent of the majority of all its members consulted by letter, ask him to remain until the next Congress.

The past Presidents of the Association may be appointed Honorary Presidents.

The mandates of Honorary Presidents and of Members of Honour are conferred for life.

The Commission shall always have the power to complete its number by co-opting delegates of the participating Administrations and adherent Governments. In this case, a final election shall be made at the following Congress.

When the place of meeting of a Congress has been fixed, the Permanent Commission shall have power to co-opt as temporary members, representatives of the country in which the Congress is to be held.

ART. 7. — The Permanent Commission shall elect from among its members a president and two vice-presidents at its first meeting after each Congress of the Association.

The president and one of the vice-presidents shall be chosen from the Belgian members.

The Commission shall appoint a general secretary, a secretary-treasurer and secretaries. As such they shall have the right to attend the meetings in a consultative capacity.

The Commission shall be summoned by the President when the business of the Association requires it, but in any case at least once a year.

A meeting may be held when demanded by any five members.

Questions shall be decided by the votes of the majority of members present. If the votes are equal, the Chairman shall have the casting vote.

Minutes shall be kept of the proceedings of the Commission. Nine members shall form a quorum.

If at a first meeting this number is not present, the meeting shall be adjourned for not longer than one month, when it shall then be considered valid whatever may be the number of members present.

ART. 8. — The Association shall be represented in Courts of Justice and in all civil actions by the president, or in the event of his being unable to attend, by the general secretary of the Permanent Commission.

### Executive Committee.

ART. 9. — At its first meeting after a Congress the Permanent Commission shall nominate three of its members, who, with the president and the vice-presidents of the



Commission, shall form an Executive Committee.

The president of the Permanent Commission shall also be president of the Executive Committee.

The general secretary, the secretary-treasurer and the secretaries of the Commission shall be members of the Committee, and shall have the right to take part in discussions, but not to vote.

The members of the Executive Committee shall hold office for a period equal to the interval between two Congresses. They shall be eligible for re-election.

The Executive Committee shall meet at the instigation of the president on his own authority or at the request of three members.

The Committee shall be responsible for the management of current affairs and for financial business, also for superintending and managing investigations, reports and publications; for the editing of the *Bulletin* and for the care of the library and archives. It shall decide as to printing in whole or in part the reports and other documents submitted to a Congress, the circulation of which it regards as necessary to facilitate the discussions. It shall be the duty of the Committee to furnish members of the Association with such special information as they may require.

The Committee shall have the right to appoint and to dismiss the staff.

The carrying out of the decisions of the Committee is entrusted to the president and the general secretary.

### Congresses.

ART. 10. — At each Congress the Association shall fix the time and place for the following Congress.

The Permanent Commission may alter such arrangements under exceptional circumstances.

ART. 11. — The following shall have a right to attend the meetings:

1) The members of the Permanent Commission, the secretaries and the secretary-treasurer;

2) Delegates appointed by the participating Administrations and adherent Governments and Organisations.

These must belong to the regular and permanent staff of the delegating Administration;

3) The secretaries of sections, and the reporters appointed by the Permanent Commission or by the Executive Committee to report on the items on the agenda.

ART. 12. — The participating Railway Administrations shall be entitled to nominate a number of delegates in proportion to the mileage of their system in the following ratio:

One delegate for lines of not more than 200 km. (124 miles);

Two delegates for lines of 200 to 500 km. (124 to 311 miles)

One additional delegate for each additional 500 km. (311 miles) or fraction thereof above 500 up to 3 000 km. (1 864 miles);

One additional delegate for each additional 1 000 km. (621 miles) or fraction thereof above 3 000 up to 6 000 km. (1 864 up to 3 728 miles);

One additional delegate per 2 000 km. (1 242 miles) or fraction thereof above 6 000 up to 10 000 km. (3 728 up to 6 214 miles);

One additional delegate per 4 000 km. (2 485 miles) or fraction thereof above 10 000 km. (6 214 miles).

The adherent Governments and Organisations may nominate delegates to a maximum number of 10 in the proportion of one delegate for each 100 gold francs subscription up to 500 gold francs, and one additional delegate for each 250 gold francs over 500 gold francs.

The maximum figures quoted above do not include those members who take part in the Congresses in accordance with the 1st and 3rd paragraphs of article 11, and whom the participating Administrations, or adherent Governments and Organisations include amongst their delegates.

All delegates participate in the Congresses with equal rights.

ART. 13. — At the opening of each Congress the officers of the Permanent Commission shall hold office temporarily, and the Congress immediately elect its own officers as follows:

1) One or more honorary presidents and vice-presidents;

2) One president;

3) One or more general secretaries and one or more assistant secretaries.

The presidents of sections, elected as explained in article 14 following, shall also be included.

The delegate nominated first by each government shall be an ex-officio vice-president.

All officers shall be appointed for the duration of the Session.

The election shall take place according to the rules laid down in article 16, paragraph 6. The duties of the officers shall be those laid down by standing orders adopted by deliberative assemblies for the conduct of their proceedings.

After the appointment of the officers, the Congress shall resolve itself into sections, according to the arrangements of items on the agenda submitted by the Permanent Commission.

A member may enter his name for more than one section.

The Congress may also appoint special committees to investigate certain questions.

ART. 14. — Each section or committee shall appoint its own officers consisting of :

1) A president;

2) One or more vice-presidents;

3) One or more principal secretaries and secretaries.

The principal secretaries of each section or committee, however, shall be nominated by the Permanent Commission.

The sections and the special committees shall cease with the termination of each session.

ART. 15. — The discussions of the Congress shall be confined to the questions set down in the agenda for the session by the Permanent Commission. The latter may receive suggestions, either as regards the inclusion of a question or relating to a particular question already raised by participants or adherents.

A reporter appointed by the Permanent Commission, shall prepare a brief outline of each question placed on the agenda, together with a résumé of the documents he has been

furnished with; he will not draw up the final summary.

No question shall be discussed at a general meeting without having been first considered by a section or special committee.

ART. 16. — The discussions shall be conducted in French and in the language of the country in which the Congress is held. Speeches in any other language shall be translated into French.

The minutes and reports shall be drawn up in French, but speakers on demand shall be entitled to have their original words reproduced.

The officials of the respective sections shall draw up an abstract of the discussions setting forth the various opinions expressed in the section. After receiving the approval of the section these abstracts shall be submitted to the general meeting. They shall then be inserted in the minutes after having been completed by the addition, if necessary, of any new opinions expressed at the general meeting itself.

The Congress shall not vote except on questions of management or organisation.

On these special questions, the votes of the majority of the members present shall be taken by members rising in their places. If there is any doubt the votes shall be counted. A roll call shall not be held except at the request of not less than twelve members.

### Subscriptions and auditing of accounts.

ART. 17. — The expenses of the Congresses, of the Permanent Commission and of the Executive Committee shall be covered by :

1) The annual subscription of members;

2) Subsidies and other casual receipts.

The annual subscription shall consist of :

a) In the case of adherent Governments and Organisations, such an amount as they may decide, but which in the case of member Organisations shall not be less than 200 gold francs;

b) For the member Administrations, a fixed sum of 200 gold francs plus a sum proportionate to the length of the system. This variable sum is fixed by the Permanent Commission, but may not exceed the third of a gold franc per kilometre.

The financial year shall begin on the 1st January.

ART. 18. — Payment of the subscriptions entitles participating Administrations, Governments and adherent Organisations to receive free as many copies of reports, of the proceedings and other publications as the number of their delegates.

ART. 19. — The Permanent Commission shall present to each Congress a report on the financial position. The Congress shall appoint two auditors to pass the accounts.

### **Revision of the constitution, dissolution and liquidation.**

ART. 20. — The rules may be revised by the Congress on the proposal of the Permanent Commission, due notice being given to the participants and adherents by a letter sent out at least two months before the opening of the session.

Proposals for modifications put forward by participants or adherents must reach the Permanent Commission at least six months before the opening of the session. If they are adopted by the Commission, they are submitted to the Congress by means of a report sent out by the Commission, which should be despatched to the participants and adherents at least two months before the opening of the session.

If the Permanent Commission does not accept a proposed modification, it shall not be submitted to the Congress, unless it is supported in writing by participating Administrations or adherent Governments or Organisations entitled to be represented by 100 delegates at the Congress. In this case the proposition is submitted to the participants and adherents by a letter from the Permanent Commission sent out at least two months before the opening of the session.

ART. 21. — Every proposal for amending the rules shall be discussed by the Congress on a report of a special committee presided over by the President of the Permanent Commission, or by his delegate and composed of eleven members, as follows:

a) The President of the Permanent Commission or his delegate;

b) Four members delegated by the Permanent Commission;

c) One delegate from each of the five sections which form the Congress, this dele-

gate being chosen after discussion of the suggestion by the section;

d) One delegate representing the authors of the suggestion.

ART. 22. — The proposed modification shall only be considered if it is supported by the clear majority of the delegates present at the general meeting.

The modification shall not be finally adopted until a written ballot has been taken, which shall be called for by a circular letter sent out by the Permanent Commission during the month following the termination of the session of the Congress. In this ballot each Administration, Government or Organisation belonging to the Association shall have a number of votes equal to the number of the delegates to which it is entitled.

The ballot shall be closed six months after the termination of the session of the Congress.

Only those modifications will be adopted which are supported by two-thirds of the votes received at headquarters of the Permanent Commission by the end of this period.

The results of the ballot will be published in the monthly *Bulletin* of the Association.

ART. 23. — Adherent Governments and Organisations, also participating Administrations constituting the Association pledge themselves to promote the meetings of the Congress and the work of the Permanent Commission.

ART. 24. — The Association may be dissolved only by a three quarters majority, on a postal vote from the participating Administrations, each one having a number of votes equal to that of the delegates to which it is entitled.

ART. 25. — In the event of dissolution, the Permanent Commission shall have authority to arrange the liquidation.

The assets of the Association are to be distributed by its agency among works conforming with the objects of the Association or among philanthropic works in connection with railways.

ART. 26. — In no circumstances shall participating Administrations and adherent Governments and Organisations who for any reason have ceased to belong to the Association, have any claim on the assets of the Association.



# LIST OF COUNTRIES

included in the International Railway Congress Association.

---

Argentina;	United Kingdom of Great	Nicaragua;
Australia;	Britain and Northern Ire-	Norway;
Austria;	land and dependent Over-	Pakistan;
Belgium, Belgian Congo and	seas territories;	Paraguay;
Ruanda-Urundi;	Ghana;	Peru;
Bolivia;	Greece;	Philippines;
Brazil;	Haiti;	Poland;
Bulgaria;	Hungary;	Portugal and Overseas ter-
Burma;	India;	ritories;
Cambodia;	Indonesia;	Rumania;
Canada;	Iran;	Salvador;
Ceylon;	Iraq;	Siam;
Chile;	Ireland (Republic);	Spain;
China;	Israel;	Sudan;
Colombia;	Italy;	Sweden;
Costa Rica;	Japan;	Switzerland;
Cuba;	Jugoslavia;	Turkey;
Czechoslovakia;	Lebanon;	Union of South Africa;
Denmark;	Luxemburg;	Union of Soviet Socialist
Dominica (Republic);	Mexico;	Republics;
Ecuador;	Kingdom of the Netherlands	United Arab Republic;
Finland;	(Netherlands, Suriname,	United States of America;
France, and French Union;	the Netherlands Antilles	Uruguay;
Germany (Federal Republic);	and New Guinea);	Viet-Nam.
	New Zealand;	

---

---







**PRINTED IN BELGIUM**

**M. WEISSENBRUCH & Co. Ltd.**  
**Printer to the King**

(Manag. Dir.: P. de Weissenbruch,  
238, chaussée de Vleurgat, XL)

**Edit. responsable: P. Ghilain**